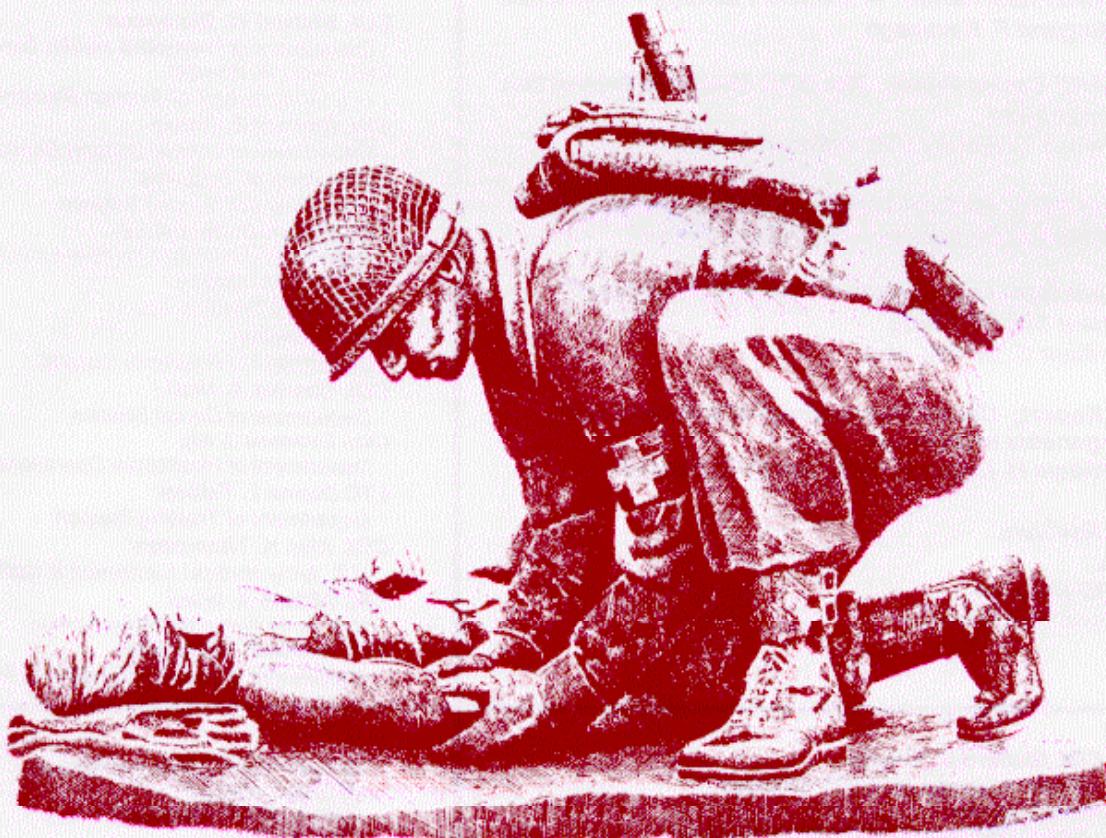


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Joel B. Hudson

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Perspective

Medic Training 2000

Combat medics form the core of the combat medical mission and are represented in virtually every medical and combat maneuver unit in the Army. Enlisted combat medics in the Active and Reserve Component are far and away the largest group of medical providers in the AMEDD. In all respects, the combat medic is the backbone of the AMEDD warfighting mission.

The AMEDDC&S has embarked on the largest study ever of the combat medic (MOS 91B) program entitled "Medic Training 2000." This 3-year study will examine the current needs and performance of medics in both line table of organization and equipment and fixed table of distribution and allowance units. Surveys from four U.S. Army Forces Command posts, will be used to gather information from our immediate "customers," the units themselves.

The project will also examine current training needs and methods, as well as sustainment and distance learning in detail. The AMEDDC&S' Center for Healthcare Education and Studies will lead the effort, ably assisted by an advisory group composed of medical noncommissioned officers, drill sergeants, physicians, physician assistants, nurses, and medical service officers. Results of the study will be used to chart a course for short-term improvements and will be available toward the end of 1998.

This issue of the AMEDD Journal examines a number of issues that relate to combat medic training.

- *Beyond MPT: Medical Training for High Profile Units.* Describes a unique program to augment Medical Proficiency Training in line units.
- *Rheumatic Findings in Gulf War Veterans.* Examines the incidence of specific medical complaints in service members who served in Operation Desert Storm. Since combat medics are often the first link in medical care and are frequently closest to the point-

of-injury, their observations and documentation can be critical to piecing together future medical mysteries.



Major General James B. Peake

- *Operation Assistance: A Medical Planning Perspective.*

Describes the Canadian experience in providing humanitarian medical assistance. Many future Army missions may involve this type of operation, and all AMEDD personnel need to be trained and ready to meet these challenges.

Other articles of interest in this issue of the Journal include:

- *TRICARE Senior Prime. The DOD Medicare Subvention Demonstration.* Highlights the recently authorized collaboration between the DOD and the Healthcare Finance Administration to allow financing of Medicare-eligible retirees treated in military hospitals.

- *Inpatient Burn Unit Length of Stay and Analysis of Treatment Supply Costs.* Reports on a retrospective study of percent body surface area burned and patient demographics to length of stay and supply costs of severely burned patients.

- *Dental Management of a Patient with Osteogenesis Imperfecta.* A case report on the dental management of molar extraction in a patient with the bone-forming disease osteogenesis imperfecta.

Through a continual process of evaluation and improvement in training, the AMEDD's combat medics will continue to conserve the fighting strength.

Rheumatic Findings in Gulf War Veterans

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Rheumatic symptoms are common among soldiers in war and peace.¹⁻⁵ The goal of this study was to retrospectively describe the specific rheumatic diagnoses and the frequency of abnormal serologic test results in the first 250 Gulf War veterans evaluated in comprehensive clinical evaluation program (CCEP) at Wilford Hall Medical Center (WHMC) and Brook Army Medical Center (BAMC), San Antonio, TX, between Nov 94 and Apr 95.

Introduction

Of the 250 Gulf War veterans evaluated in the CCEP, 139 (56%) were referred for rheumatology consultation, which was the most common elective subspecialty referral. Of the patients evaluated, 82 (59%) had soft tissue syndromes, 19 (14%) had rheumatic disease, and 38 (27%) had no rheumatic disease. The most common soft tissue syndromes were patellofemoral syndrome (33 patients [25%]), mechanical low back pain (23 patients [18%]), and fibromyalgia (22 patients [17%]). Of the 19 patients with rheumatic disease, 10 had osteoarthritis, 2 had rheumatoid arthritis, 2 had gout, and 1 each had systemic lupus erythematosus (SLE), Behcet disease, parvovirus arthritis, psoriatic arthritis, and hypothyroid arthropathy. Abnormal serologic test results were common among the Gulf War patients regardless of the presence or absence of rheumatic disease.

Patients and Methods

The medical records of the first 250 consecutive Gulf War veterans referred to the CCEP at WHMC

and BAMC were reviewed for demographic characteristics and frequency of subspecialty consultations. A retrospective review of rheumatic diagnoses and the frequency of abnormal serologic test results was recorded.

The CCEP is a voluntary program available for Department of Defense (DOD) beneficiaries, initiated in Jun 94, and consists of two clinical phases.⁶ After Jan 95, the CCEP evaluations were redefined. The first phase consisted of a comprehensive history and physical examination along with complete blood cell count, urinalysis, and chemistry profile. Further testing and consultation were carried out at the discretion of the examiner. Rheumatology consultation could be recommended at any time during the CCEP evaluations. The second phase, if clinically indicated, included determinations of erythrocyte sedimentation rate (ESR), C-reactive protein, rheumatoid factor (RF), antinuclear antibody (ANA), liver-associated enzyme, creatine kinase (CK), purified protein derivative, vitamin B₁₂, and folate; serologic testing for human immunodeficiency virus (HIV) and hepatitis A, B, and C; a Venereal Disease Research Laboratories (VDRL) test; thyrotropin and thyroid function tests; and chest radiography. Dental, infectious disease, and psychiatry evaluations were also included in the second phase.

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The presence of RF was determined at BAMC by latex agglutination, with a seropositive result reported as a titer greater than or equal to 1:160. The presence of RF was determined at WHMC by fluorescent immunoassay, with a seropositive result reported as greater than 15 IU/mL. The ANA was determined at both medical centers by indirect fluorescent antibody using human epithelial tissue (Hep 2) cell line with a positive titer reported as

greater than or equal to 1:160. The level of CK was determined by an enzyme calorimetric procedure at BAMC (Kodak Ektachem) (normal level, 20-325 U/L for males and females) and at WHMC (Hitachi 747, Boehringer Mannheim method) (normal level, 24-170 U/L for females and 24-195 U/L for males).

The rheumatic diagnoses were obtained from a review of the rheumatology consultations performed by seven board-certified rheumatologists from WHMC and BAMC. Patients' conditions as evaluated by rheumatology were categorized as noninflammatory and/or soft tissue syndromes, rheumatic disease, or no rheumatic diagnosis.

Results

A total of 250 completed CCEP evaluations were reviewed. The demographic information is given in Table 1. Patients referred for rheumatology evaluation were similar in demographic characteristics to those not evaluated by a rheumatologist. Of the 250 Gulf War patients evaluated, 139 (56%) were referred for rheumatology consultation. Rheumatology was the most common elective subspecialty referral followed by gastroenterology (111 [44%]), pulmonary (104 [42%]), and dermatology (100 [40%]).

Of the 139 Gulf War patients evaluated by rheumatology, 82 (59%) had soft tissue syndromes, 19 (14%) had rheumatic disease, and 38 (27%) had no rheumatic diagnosis. There

were a total of 130 soft tissue syndromes diagnosed among the 139 rheumatology evaluations (Table 2).

Demographics	Rheumatology Consultation		
	Yes	No	Total
Total patients	139 (56)	111 (44)	250 (100)
Sex			
Male	115 (83)	101 (91)	216 (86)
Female	24 (17)	10 (9)	34 (14)
Mean age, y	34	34	34
Race			
White	80 (58)	71 (64)	151 (60)
African American	36 (26)	27 (24)	63 (25)
Hispanic	21 (15)	11 (10)	32 (13)
Asian	2 (1)	2 (2)	4 (2)
Military branch			
Army	96 (69)	72 (65)	168 (67)
Air Force	33 (24)	31 (28)	64 (26)
Navy	8 (6)	6 (5)	14 (6)
Marines	2 (1)	2 (2)	4 (2)
Military status			
Active duty	128 (92)	93 (83)	221 (88)
Retired	8 (6)	10 (9)	18 (7)
Reserve/National Guard	2 (1)	4 (4)	6 (2)
Civilian, DOD	0 (0)	2 (2)	2 (1)
Dependent of active duty	1 (<1)	2 (2)	3 (1)
Military rank			
Enlisted	130 (94)	99 (89)	229 (92)
Officer	8 (6)	8 (7)	17 (7)
Civilian	1 (<1)	4 (4)	5 (1)

* Other than mean age, all values are expressed as a number (percentage)

Table 1. Demographics of the 250 Gulf War Patients *

The most common soft tissue conditions seen were patellofemoral syndrome (33 patients [25%]);

mechanical low back pain (23 patients [18%]), fibromyalgia (22 patients [17%]), and shoulder tendinitis and/or bursitis (12[9%]). Nineteen patients (14%) were diagnosed as having a rheumatic disease according to the American College of Rheumatology diagnostic criteria for each disease (Table 3). They included 10 with osteoarthritis, 2 with rheumatoid arthritis, 2 with gout, and 1 each with SLE, Behcet disease, parvovirus arthritis, psoriatic arthritis, and hypothyroid arthropathy. Thirty-eight patients (27%) were placed into the category of no rheumatic diagnosis. This subset of patients had no evidence of an underlying inflammatory rheumatic or connective tissue disease and had no definable mechanical or soft tissue syndrome. The majority of the patients with no rheumatic disease were given the diagnosis of arthralgia and/or myalgia or pain syndrome of undetermined cause.

There were a total of 22 patients diagnosed as having fibromyalgia (15 men and seven women). Two patients were positive for hepatitis C, and one patient was positive for ANA at a titer of 1:160 without evidence of connective tissue disease. The rest of the patients with fibromyalgia had normal laboratory test results. Of the 22 patients with fibromyalgia, 16 underwent psychiatric evaluations, with a total of 28 diagnoses (7-depression, 5-post-traumatic stress disorder (PTSD), 3-cognitive disorder, 3-hypochondriasis, 2-somatization disorder, 2-history of alcohol dependency, 2-anxiety disorder, 1-dysthymic disorder, and 3-nonspecific diagnoses). Fifteen of the 22 patients underwent neuropsychological testing and were given a total of 17 diagnoses (5-cognitive disorder, 4-adjustment disorder, 3-PTSD, 1-somatization disorder, and 4-nonspecific findings). There was significant variability between the psychiatric and the neuropsychiatric diagnoses.

The frequency of individual laboratory abnormalities was similar between patients referred to rheumatology and those not referred (Table 4). Abnormal serologic test results were relatively common among the 250 patients. The denominator for each laboratory test varied depending on the time of patient enrollment in the CCEP program.

Abnormal results on serum protein electrophoresis (SPEP) was the most common laboratory finding. Of the patients referred to

Diagnosis	Number (Percent)
Patellofemoral syndrome	33 (25)
Mechanical low back pain	23 (18)
Fibromyalgia	22 (17)
Shoulder tendinitis/bursitis	12 (9)
Epicondylitis	7 (5)
Benign hypermobility syndrome	7 (5)
Myofascial pain syndrome	6 (5)
Plantar fascitis	5 (4)
Pes planus	5 (4)
Other**	10 (8)

* There were 130 soft tissue syndromes in 82 patients.

**There were 2 cases of trochanteric bursitis, 2 of paracervical muscle spasm, 1 of Achilles tendinitis, 1 of shin splints, 1 of De Quervain tenosynovitis, 1 of prepatellar bursitis, and 1 of carpal tunnel syndrome.

Table 2. Soft Tissue Syndromes *

Diagnosis	Number
Osteoarthritis*	10
Rheumatoid arthritis	2
Gout	2
Other**	5
Total	19

* There were 4 cases involving the lumbosacral spine; 2, the cervical spine; 2 the knee; and 2, the hand.

** There was 1 case each of SLE, Behcet disease, parvovirus arthritis, psoriatic arthritis, and hypothyroid arthropathy.

Table 3. Rheumatic Disease in Gulf War Veterans

Laboratory Data	Rheumatology Consultation, No. (Percent)		
	Yes	No	Total
Elevated Westergren ESR	2/131(2)	0/87 (0)	2/218 (1)
Elevated C-reactive protein level	4/132 (3)	3/92 (3)	7/224 (3)
Positive for RF	16/135 (12)	5/93 (5)	21/228 (9)
Positive for ANA	10/137 (7)	4/95 (4)	14/232 (6)
Elevated CK level	15/137 (11)	8/93 (9)	23/230 (10)
Positive result on Lyme ELISA	12/120 (10)	9/82 (11)	21/202 (10)
Positive VDRL result	0/125 (0)	3/93 (3)	3/218 (1)
Positive for HIV	0/129 (0)	0/92 (0)	0/221 (0)
Seropositive for hepatitis*	3/127 (2)	7/90 (7)	10/217 (5)
Serum protein electrophoresis	31/94 (33)	29/64 (45)	60/158 (38)
Abnormal thyroid function test result	1/132 (<1)	2/96 (2)	3/228 (1)

* There were 3 cases of hepatitis C inpatients evaluated by rheumatology and 3 of hepatitis C and 4 of hepatitis B in the patients not evaluated by rheumatology.

Table 4. Laboratory Data From 250 Gulf Veterans

rheumatology, 31(31%) of 94 had abnormal screening SPEP results: 15-hypergammaglobulinemia (12-nonspecific, 1-SLE, 1-anti-hepatitis B core), 9-elevated α_1 or α_2 fraction (5-nonspecific, 1-rheumatoid arthritis, 1-hepatitis steatosis, 1-sickle cell trait, and 1-metastatic adenocarcinoma), 5-decreased β -globulin (4-nonspecific, 1 anti-hepatitis B core), 1-monoclonal spike associated with anti-hepatitis A virus, and 1 with hyperproteinemia for nonspecific reason. Eleven of the 15 patients with hypergammaglobulinemia had a coexistent positive autoantibody result (RF in 6, ANA in 2, anticardiolipin antibodies in 2, and Lyme disease on enzyme-linked immunosorbent assay [ELISA] in 1). Ten of the 15 were diagnosed as having a soft tissue syndrome, 4 had no definable rheumatic disease, and 1 had SLE. The SPEP results were abnormal in 29 (45%) of 64 patients not evaluated by rheumatology: 21-hypergammaglobulinemia (18-nonspecific, 2-hypothyroidism, 1-hepatitis B surface antigen), 7-elevated α_2 -globulin level for nonspecific reasons, 2-

decreased β -globulin level (1-hepatitis C, 1-hepatitis B surface antigen), and 3 other nonspecific abnormalities (1 α_1 -globulin, 1-monoclonal spike, and 1-hyperproteinemia). Associated seropositive results associated with hypergammaglobulinemia in this subset included RF in two patients, ANA in 3 and VDRL in 2.

Twenty-one (9%) of 228 patients were positive for RF, but only two patients were diagnosed as having rheumatoid arthritis. The ANA titer was abnormal in 14 (6%) of 232 patients, with only one patient diagnosed as having SLE. An elevated CK level was noted in 23 (10%) of 230 patients; 22 of the 23 were male and 15 were African American. One patient with an elevated CK level evaluated by rheumatology had hypothyroid arthropathy and none of the other patients were diagnosed as having myositis. A total of three muscle biopsies were performed, the findings of which were all normal. Serologic tests were positive for

hepatitis in 10 (5%) of 217 patients: hepatitis C in three patients evaluated by rheumatology and hepatitis B and C in four and three patients, respectively, not evaluated by rheumatology.

The ELISA was positive for Lyme disease in 11 patients and five were negative for Lyme disease on Western blots. None of the patients had any risks for Lyme disease, nor were they from endemic areas. Of the remaining six patients, one was positive for ANA; 1, for *Giardia lamblia*; 1, for *Enterobius vermicularis*; 1, for antibodies to hepatitis B surface antigen; and 1, for antibodies to hepatitis B core antigen.

Comments

It is estimated that 15% to 33% of adult Americans suffer from a musculoskeletal disorder.^{7,8} Musculoskeletal complaints are the second most common symptom for which patients seek medical attention and the third leading diagnosis made by internists, resulting in a significant number of outpatient visits for primary care physicians.^{9,10} Musculoskeletal disorders are extremely common among active duty soldiers and can be a major cause of disability.^{3,4} Furthermore, rheumatic complaints have been frequently described in war-related syndromes from the U.S. Civil War to the Gulf War.^{1,2,5}

A high frequency of rheumatic symptoms and diagnoses was observed in our Gulf War patients, a finding that supports the previous observations described in the literature.^{2,5} In fact, the rheumatic diagnoses established in our patients after the Gulf War were not different from those diagnoses reported by West during Operation Desert Storm (ODS).⁴ Rheumatic diseases were seen in 19 (14%) of the Gulf War patients in our study population, with more than half having osteoarthritis. The incidence of individual rheumatic diseases reflected that which would be expected in the general population.^{7,8} Soft tissue syndromes were the most common rheumatic diagnoses (59%) among our Gulf War patients. The most frequently diagnosed soft tissue diagnoses were patellofemoral syndrome, mechanical low back pain, and fibromyalgia. In two previous studies of rheumatic disease in the military population, mechanical low back pain and patellofemoral syndrome were also the most commonly diagnosed conditions.³ However, we observed a much higher incidence of fibromyalgia than was seen previously. In our study, 17% of patients referred to rheumatology were diagnosed as having fibromyalgia, compared with 8% diagnosed at an evacuation hospital during ODS and 8% of Air Force recruits who have to be medically discharged for fibromyalgia.^{3,4} Both of these studies were large;

therefore, the difference may simply be a reflection of study size or could have represented a manifestation of PTSD after the Gulf War.¹¹ However, the 22 patients with fibromyalgia in our study demonstrated a wide variety of psychiatric diagnoses, and only five patients were diagnosed as having PTSD by formal psychiatric evaluation and three by neuropsychological testing.

Although we can conclude that the rheumatic diagnoses are not unique to Gulf War veterans, the high percentage of unexplained symptoms of arthralgia and/or myalgia is still a challenging clinical question. Of all primary care visits, 25% to 50% are made by patients who do not have a serious medical cause for their presenting symptom.¹²⁻¹⁴ Musculoskeletal symptoms are common and nonspecific in patients who may have functional impairment or underlying psychiatric disorders.^{5,15} Thirty-eight patients (27%) in our study had musculoskeletal symptoms without a definable rheumatic diagnosis. When these patients were compared with those who had a definable rheumatic diagnosis and with those who were not referred to rheumatology, there was no difference in any single demographic factor or type of abnormal laboratory test result. The patients in this ill-defined subset of Gulf War veterans have recently been referred to as having the "arthromyoneuropathy" syndrome, which is characterized by joint and muscle pains, muscle fatigue, difficulty in lifting, extremity paresthesias, and have frequently been labeled or diagnosed as having the Gulf War syndrome.¹⁶ Physicians must resist the pressure to diagnose a disease in these patients for which scientific evidence is lacking.¹⁷ In general, clinical psychiatric diagnoses and/or abnormal findings on neuropsychiatric testing were more commonly described among this patient subset in our study, although this observation was not statistically significant in those patients who were studied. These Gulf War patients may have to be followed up for many years to better clarify the cause of their symptoms.

In an effort to detect diseases accounting for the Gulf War syndrome, mandatory serologic testing was performed for an extended period during the CCEP evaluations. The diagnostic utility of serologic screening in Gulf War patients is debatable, since multiple serologic tests have been analyzed for their sensitivity, specificity, predictive value, and the accepted consensus is that serologic testing is most useful when there is clinical suspicion of disease.¹⁸⁻²⁴ Abnormal results on serologic testing were common among all our Gulf War patients who were reviewed, regardless of the presence or absence of rheumatic disease. The SPEP was the most common serologic test with abnormal results in our patient population.

Patients referred to rheumatology had a slightly higher incidence of positivity for RF and ANA or of an elevated CK level than patients not seen by a rheumatologist, although this is most likely a referral bias. A false-positive result on ELISA for Lyme disease was common, even in the absence of risk factors for, or clinical evidence of Lyme disease. All of the rheumatic diagnoses were established using diagnostic criteria, and no diagnosis was made on the basis of positive serologic test results alone. Our serologic observations support the medical literature in that the test results were most useful when they were negative, and the overall results of serologic screening were poor predictors of the presence of disease.^{18,25}

There are several limitations to our study. First, all the patients in our study did not undergo the same CCEP screened evaluation. Some patients underwent mandatory evaluations when they were screened before Jan 95, and patient evaluations after this time were determined using clinically selected tests and consultations. This significant evaluation bias does not allow us to compare patients with each other, nor does it allow us to accurately determine the sensitivity or specificity of serologic screening tests in our patient population. Second, we did not include environmental exposures during the Gulf War that varied among our patients and that may have influenced symptoms, medical conditions, and abnormal serologic test results, but this was beyond the scope or intent of this descriptive clinical study. Third, interpretations based on comparisons with other patient populations should be made with caution and only with the explicit recognition of the limitations of the CCEP as a selected case series.⁶

In conclusion, many Gulf War veterans fear they are suffering from a chronic disabling disease, although there is no evidence of a previously unknown disease among Gulf War veterans.^{26-28,6} Also, there is no excess of unexplained hospitalizations among Gulf War veterans who have remained on active duty since the end of the war.²⁹ The presence and frequency of rheumatic manifestations of the Gulf War appear to be similar to symptoms and diagnoses described in previous wars, and they are not unique to active duty soldiers.^{1,2,4-8,15}

Conclusions

Approximately 700,000 U.S. troops were deployed to the Persian Gulf to liberate Kuwait from Iraqi occupation during operations Desert Shield and Storm between Aug 90 and Apr 91.²⁶ While most veterans with illnesses from the Gulf War have had

diagnosable conditions, thousands of veterans are seeking medical care for unexplained symptoms of chronic fatigue, rash, headache, arthralgia, myalgia, diarrhea, impaired concentration, forgetfulness, irritability, and sleep disturbance.^{26-28,6} This complex of symptoms has been referred to as Gulf War syndrome or Gulf War illness. Although the cause of these symptoms remains unclear, many troops were exposed to potentially adverse substances in the hostile wartime environment, including chemical toxins, infectious agents, and multiple simultaneous immunizations.³⁰⁻³³ In response to the symptoms of the Gulf War veterans, the DOD and the Department of Veterans Affairs developed similar, CCEP for the evaluation and treatment of the veterans' illnesses.⁶ The DOD CCEP provides a systematic, extensive evaluation for DOD beneficiaries. Potential DOD beneficiaries include Gulf War veterans on active duty or retired, members of the full-time National Guard who were Gulf War veterans, Gulf War veterans from the reserve components, and eligible family members of such personnel.

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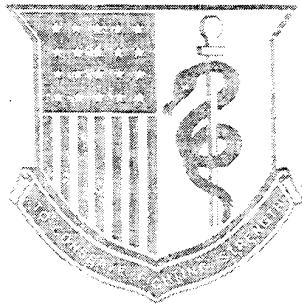
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Operation Assistance: A Medical Planning Perspective

Cdr Margaret F. Kavanagh[†]

This discussion on Operation Assistance will outline the deployment of the 1st Canadian Mechanised Brigade Group (1 CMBG) in support of the flood relief operation in southern Manitoba in the spring of 1997. This flood was the northern migration of the devastating Red River floodwaters that hit Grand Forks, Minnesota, in April of the same year (Figure 1). After watching the devastation south of the Canada-U.S. border, our federal and provincial governments activated numerous emergency measures, including the Canadian Forces (CF) in order to combat the worst flood in 500 years. This article highlights the challenges presented to the medical support planners during the military operation.

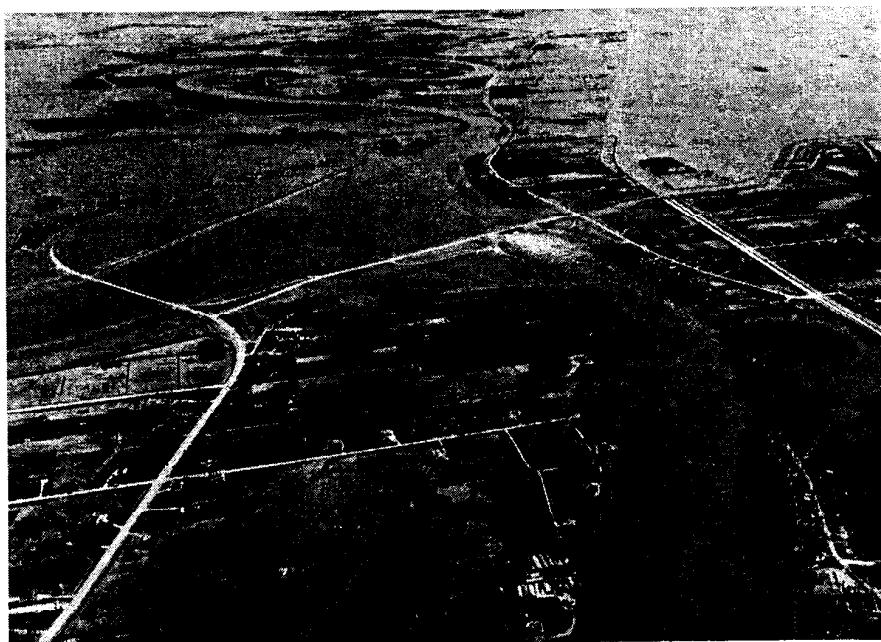


Fig 1. A view of the floodwaters south of Winnipeg. The normal course of the river can be seen through the tree line. The entrance to the floodway, which helps divert water away from the city, can be seen in the center.

Introduction

On 21 Apr 97, Land Forces Western Area (LFWA) and 1 CMBG, headquartered in Alberta over 800 miles away, were tasked to deploy to Manitoba to assist with the flood relief in southern Manitoba. Initially, a Joint Task Forces Headquarters (JTFHQ) was created in Winnipeg, Manitoba, with the Commander of LFWA as the overall Commander and the Commander of 1

CMBG as the on-scene Commander. The JTFHQ was based upon the organizational structure of the 1 CMBG HQ, which does not have any integral medical positions. Interestingly, one of the postoperation issues raised to the Commander of the Army upon completion of Operation Assistance was a recommendation to create a G1 Med position permanently within the brigade staff. For this operation, however, the HQ deployed without a medical advisor and I was not added to the HQ staff as the JTF Surgeon until the 23d of April when it became increasingly apparent that there was a need for medical input. The G1 Med cell operated on a 24/7 basis throughout the operation, with this requirement especially critical in the early stages since planning was occurring around the clock with a major change of focus occurring about every 8 to 10

hours. Written medical plans often became obsolete before they could be promulgated; therefore they were changed frequently. Our initial responsibilities were to assess the medical risks to our soldiers; to become familiar with what resources were available locally, remembering always that we could not become part of the problem; and to develop the medical support plan for the JTF. Our primary focus was the medical support to CF personnel with assistance to the civilian sector as a secondary role. To this end, it was important in the early stages to make contact with the local civilian health authorities in order to meet our needs,

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and to help understand theirs. This was accomplished through meetings and telephone conversations with the federal emergency measure personnel and the city and provincial authorities. As the magnitude of the flooding became evident, additional resources were deployed to Manitoba from 2 CMBG in Petawawa, Ontario, the Navy, the Air Force, and the CF Joint Force HQ, resulting in the involvement of over 8,600 personnel at the peak of activity. The soldiers performed duties ranging from sandbagging to dike building; from home evacuations to individual rescues; livestock rescues including 500 pigs and numerous family pets; and in the rebuilding phase—road, bridge, and building reconstruction (Figure 2).



Fig 2. Soldiers build flash boards on a dike in a small town south of Winnipeg.

Christen the Ground-Deployment of 1 CMBG Units

It is essential to understand the size of the geographical area upon which the floodwaters impacted. The map, shown as Figure 3, outlines the region south of Winnipeg to the U.S. border and the extent of the floodwaters as of 6 May 97. These maps were produced on a daily basis to indicate the severity of the floodwaters and more importantly for us to delineate the route closures. The region south of Winnipeg was the 1 CMBG Area of Responsibility (AOR), covering a geographical area greater than 300 sq mi. At this point it should also be noted that the only means of crossing the Red River was by air or if

by land, through the city of Winnipeg. To highlight the problem travel time due to road closures from the 1st Princess Patricia's Canadian Light Infantry Battalion (1 PPCLI) HQ near the Canada-U.S. border to Winnipeg at the height of activity, was at least 2 to 3 hours in an Army ambulance.

1 CMBG units were deployed in southern Manitoba with 1 PPCLI on both sides of the river in the most southern sector of the AOR. The 1st Royal Canadian Horse Artillery Regiment was west of the river; 2 and 3 PPCLI were east of the river. The city of Winnipeg was actually 2 CMBGs AOR despite having 1 CMBG troops located within its boundaries.

Another key geographical factor that had to be taken into consideration was the ring dike around the city of Winnipeg. The perimeter highway around the city is actually the dike and all of the roads leading out to the countryside pass through this dike. If the city had been in serious danger of flooding, these passageways would have been blocked, cutting off all road evacuation into Winnipeg.

1 CMBG Commander's Direction

The Brigade Commander gave very clear direction that all plans and preparations were to be made for the worst case scenario. In his words, the military was the "court of last resort and we could not fail." We also had to be able to look after ourselves and not become part

of the problem or a burden on the already stressed civilian resources. Finally, on the medical front, he decreed that all precautions were to be taken to protect the soldiers; and, to this end safety was given the top priority. Commanding Officers (COs) were reminded of this fact daily at his Commander's O Group. The Brigade Commander stated that he was not prepared to lose a single soldier on this mission, hence the emphasis on forward deployment of medical resources and rapid evacuation.

Available Medical Resources

The deployed 1 CMBG units had their own integral first line resources; however, there were some

significant shortfalls due to Operation Palladium, the CF deployment to the former Yugoslavia. 1 CMBG was involved in the inaugural Operation Palladium deployment and in the midst of the training for the first rotation. Initially, the only second line resources

available were those provided by 17 Wing, the Air Force station in Winnipeg. After the introductory assessment, it was determined that the highest priority was to increase the evacuation capability; therefore, 1 Field Ambulance was tasked to deploy its ambulances

to Winnipeg on April 24th, arriving late the next day. The remaining treatment capability, most of which was in Wainwright, Alberta, was tasked to deploy on April 27th, arriving on the next day at the same time as the Operation Palladium Battle Group. Within this Battle Group, which also had been training in Wainwright, were significant numbers of medical personnel and ambulance resources to support the deployed units. With the arrival of the additional ambulance detachments, and due to the length of the evacuation routes imposed by the floodwaters, the ambulance detachments were deployed forward in support of the first line units leaving very few ambulances within the city itself. Subsequently, the first line units actually pushed these resources even farther forward in support of subunits or even sub-subunits rather than keeping them at the Unit Medical Station (UMS). Also, as a result of the length of the evacuation routes and the availability of local civilian medical support in the small communities, it was decided to utilize the community hospitals for lab, x-ray, and inpatient services. The senior medical authority on location made the decision as to what

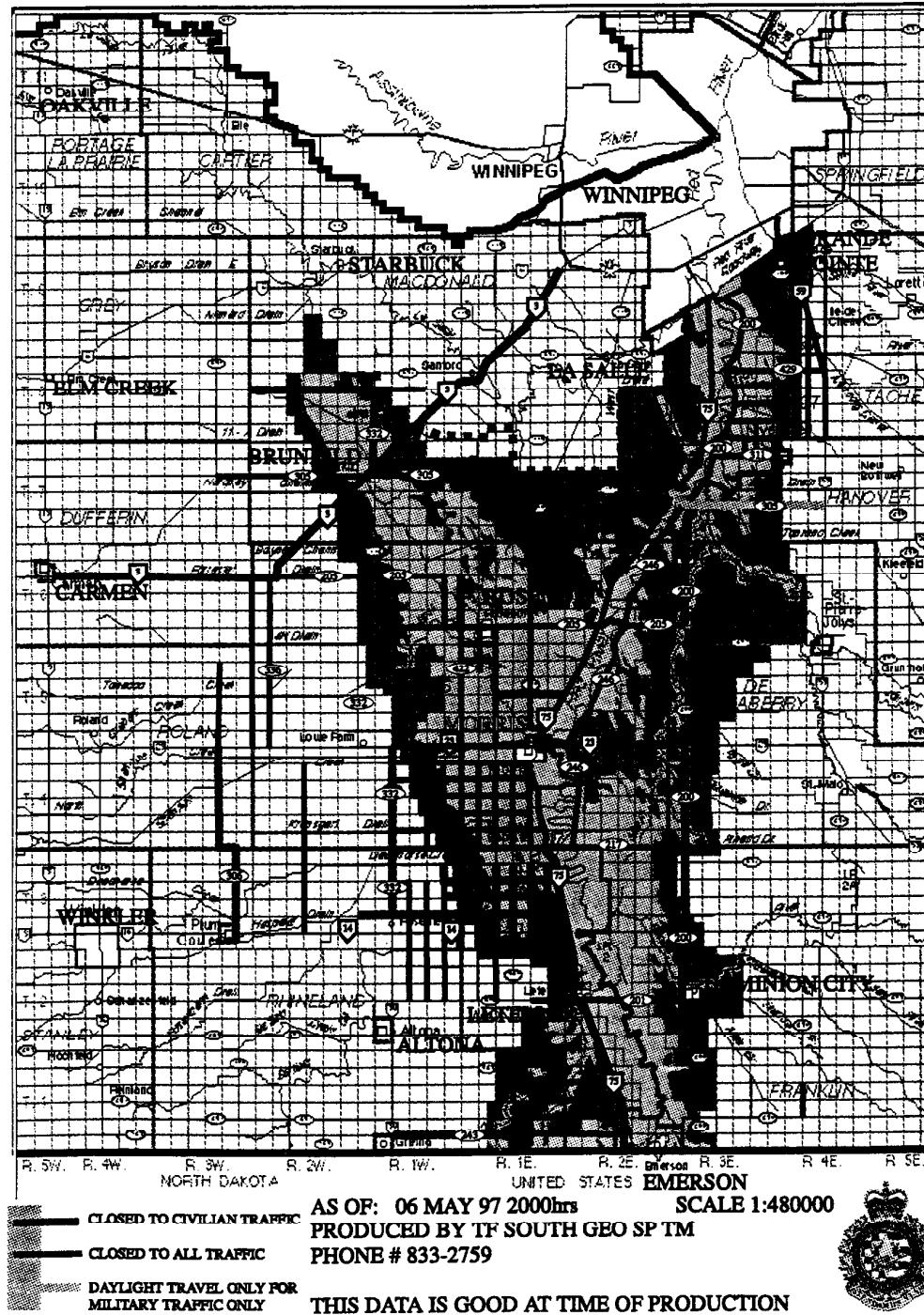


Figure 3.

facilities would be utilized. I specifically used this terminology because some of the deployed units did not have physicians but rather physician assistants as their senior medical authority. Upon arrival of 1 Field Ambulance, a 24/7 medical platoon was established in Winnipeg at the PAN AM Games HQ building which was located approximately 1 mile west of the Brigade HQ. I also deployed two medical detachments, one on each side of the river in support of the forward logistic groups. The medical detachment on the east side of the river also provided support to the 1 PPCLI troops which were isolated from their UMS by the floodwaters. Because I had pushed forward my evacuation resources I was short of personnel to fully staff my medical platoon, and since I was now actually located in the 2 CMBG AOR, 2 Field Ambulances augmented my platoon with a medical section and two ambulance detachments in return for supporting all 2 CMBG troops deployed within the city of Winnipeg. The medical platoon would now provide first line support to all personnel located within the city that did not have their own first line medical support, and second line to all CF personnel deployed in Winnipeg. The availability of this medical platoon reduced the need to

utilize civilian facilities for inpatient care except for the seriously ill or injured. Outlined on the map (Figure 4) is a summary of the deployed medical assets within the 1 CMBG AOR during peak operations.

Evacuation Resources

In keeping with the Commander's emphasis on safety and quality treatment for our soldiers and due to the length of the evacuation routes, all priority one and two patients were evacuated by air. An air medevac could be initiated by the medical assistant on scene so that the patient would be picked up at the injury site and flown directly to the Health Sciences Centre (HSC) in Winnipeg. The evacuation request was activated as shown in Figure 5, which identifies all of the command and staff positions involved in activating this system. This flow chart significantly shortened the request procedures from those originally proposed by the chain of command. Prior to Operation Assistance, the HSC did not have a helicopter pad; however, at the request of the CF, they vacated a parking lot and created a landing zone large enough to accommodate a Griffon or Labrador helicopter (Figure 6). Due to the risky nature of the work in which the soldiers found themselves, and at the Commander's direction, a 24/7 medical "CAP" (combat air patrol) consisting of an air medical evacuation team flying in either a Griffon or a Labrador was initiated for the period of peak activity. Road ambulances were utilized for the priority three patients and for medical resupply.

Preventative Medicine

At the earliest stages of this operation, several Preventative Medicine (PMed) issues had to be resolved (particularly involving immunizations and drinking water quality. After discussions with The Surgeon General's staff, it was decided that the

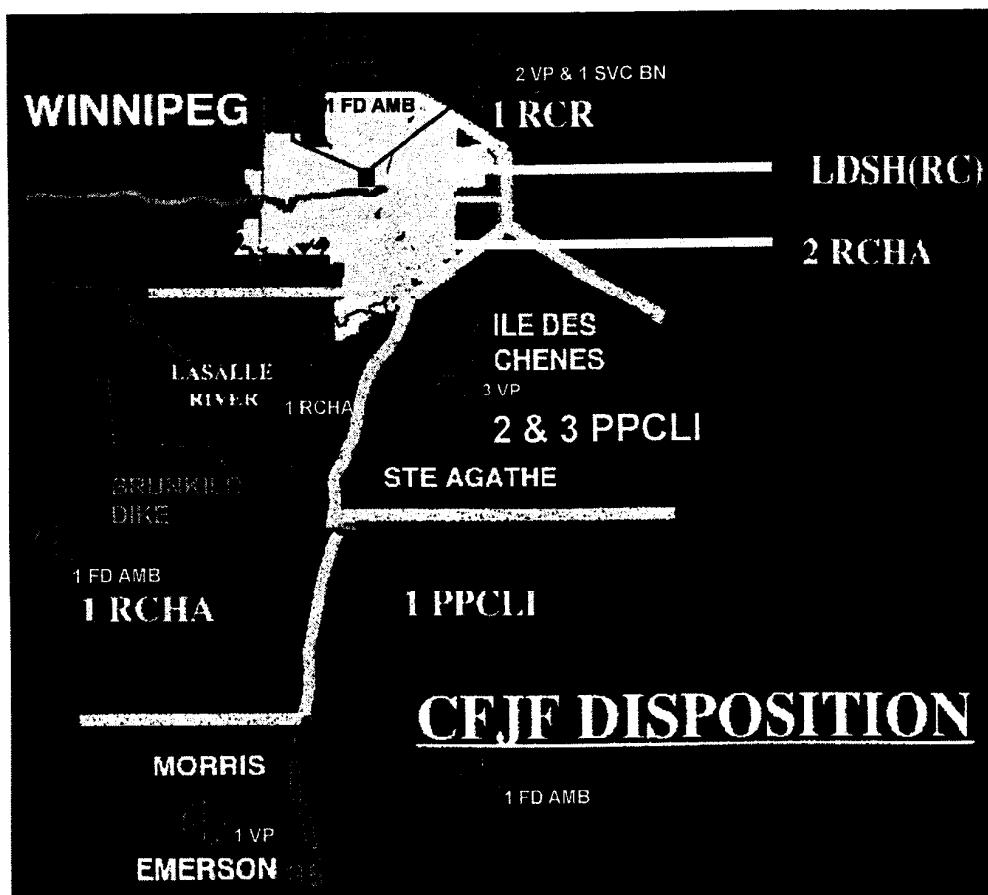


Figure 4.

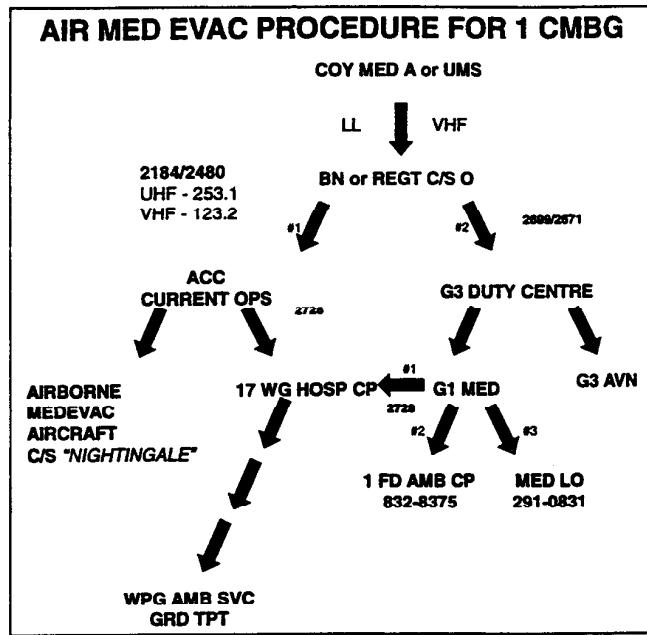


Figure 5.



Fig 6. Temporary helicopter zone at the Winnipeg HSC and a Labrador helicopter.

immunizations required were protection against tetanus and hepatitis A. The rapidity of the deployment, the large number of soldiers, the paucity of medical resources in the early stages, and the involvement of a considerable number of reservists all created obstacles to the immunization plan. It was finally decided to assume that all regular force soldiers were up-to-date on their tetanus due to accurate

records and regular "needle parades" maintained within 1 CMBG units. On the other hand, reserve soldiers do not receive the same immunization routine as the regular force, so it was assumed that they all needed a tetanus booster unless they could prove otherwise. All reserve soldiers were either immunized prior to deployment into the water zone, or for those from the local area who were already deployed before our arrival, immunization was given at the earliest possible opportunity.

Hepatitis A presented an interesting problem because we did not have the required protection readily available in either hepatitis A vaccine or immune serum globulin (ISG). Since the protection would be given after many of the soldiers had been exposed to the floodwaters, since there was a lack of physician support to vaccinate hundreds of soldiers, and because of the potential wastage of only giving one dose of a three dose regime, it was decided to use ISG as the hepatitis A protection vehicle. I must emphasize that the main reason for using ISG in lieu of the hepatitis A vaccine was that it is not a vaccine per se, and I could push it forward for the Company Med A to administer, avoiding the need for medical officers to do "needle parades" throughout the AOR and disrupt the operation. Large quantities of ISG and tetanus vaccine were procured by the pharmacy staff in Winnipeg and distributed.

The quality of the local drinking water was another major concern throughout the AOR. To this end, the Wing PMed Technician maintained daily contact with the local civilian authorities regarding the potability of the water. This information was passed out to the various COs and their PMed Techs. A reverse osmosis water purification unit was available in the event that the drinking water became contaminated, and indeed, it was used to supply water to the civilian population in the area of Ile de Chene in the early weeks of May. Close links were maintained between the PMed Techs and all of the civilian agencies regarding health and safety issues in the AOR. Fortunately nothing of consequence developed during Operation Assistance.

Medical Resupply

The 17 Wing in Winnipeg is established for a pharmacist but at the time of the Operation Assistance they did not have a pharmacist working in their hospital. The 1 CMBG pharmacist was in Wainwright supporting the Operation Palladium training, so CF Base Shilo was tasked to send their pharmacist to Winnipeg. This individual assumed the duties of the pharmacist for the JTF and was located in the 17 Wing pharmacy. This location ultimately functioned as both

a pharmacy and as a forward medical equipment depot once the Brigade pharmacists and the Air Force augmentee were added to the staff. They worked on a 24/7 basis to meet all of the medical resupply needs for CMBGs, the Wing and the Air Force augmentees, the Naval Task Force, and the JFHQ. The initial priority was to acquire the aforementioned vaccines for the deployed 1 CMBG and reserve soldiers. The early stages of this operation were extremely hectic for the pharmacy staff due in part to lack of familiarity with the local suppliers, but once the vaccine issue was resolved and the resupply system refined, everything ran very smoothly and the staff very effectively resolved all of the medical supply issues.

Medical Liaison Officer

Once the 1st Field Ambulance was deployed, there was enough staff to man the Operations Centre and the G1 Med cell on a 24/7 basis; an officer was dedicated as a medical liaison officer. This position is more familiar to us as a medical regulating officer but in the parlance of the Army, liaison officers are accepted and better understood than medical regulating officers. In the case of 1 CMBG, this position proved to be extremely helpful in coordinating the medical care for two seriously injured soldiers. This officer quickly gained the confidence of the hospital medical staff and the commanders with whom he had to deal. I believe that these positions are critical in all operations to avoid many of the perceived shortfalls in our system that have occurred in recent times with soldiers injured on duty. This officer acted as an effective go-between for the member, his unit, the CF medical system, the civilian medical system,

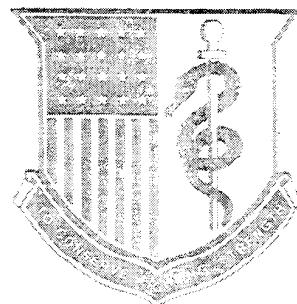
the patient's family, and outside agencies such as the personal insurance agonise and the pension board. A considerable amount of goodwill on all sides was developed through his efforts. Undoubtedly we were involved in activities that, strictly speaking, were the purview of the member's unit and not the medical services; however, I was more concerned with assisting the injured soldier than worrying about whose toes were stepped on.

Conclusion

Operation Assistance was an extremely successful operation both from a military and a humanitarian perspective. Every CF member who deployed to southern Manitoba to assist their fellow countrymen went home with a tremendous feeling of satisfaction for a job well done.

In my opinion, three key points regarding the medical support for 1 CMBG during Operation Assistance can be concluded:

- the medical support plan must be tailored to the tactical situation and the commander's direction
- the best use of the limited medical resources must be made even when there is a breakdown of normal doctrine and overlapping of areas of responsibility
- the medical liaison officer is an extremely valuable tool for coordinating many aspects of patient support



TRICARE Senior Prime: The DOD Medicare Subvention Demonstration

MAJ James T. Walsh[†]
LTC Jeffrey P. Moon^{††}

*The Department of Defense (DOD) is embarking on a program called TRICARE Senior Prime as a response to the Medicare subvention initiative undertaken by Congress in 1997. This program will, for the first time, allow the Military Health System (MHS) to demonstrate its ability to function as a *bona fide* Medicare health maintenance organization under the approval of the Department of Health and Human Services (DHHS) and the Health Care Financing Administration (HCFA). One of the objectives of the TRICARE Senior Prime program is to provide Medicare-eligible military retirees the opportunity to enroll in the TRICARE Prime healthcare option and to receive guaranteed priority health services. This 3-year demonstration will offer the DOD and the HCFA an innovative opportunity to continue offering care to Medicare-eligible military retirees over 65 who feel that their healthcare benefits are being threatened by the military's downsizing and budgetary constraints.*

Introduction

When Congress passed the Balanced Budget Act (BBA) of 1997, it directed the DOD and the DHHS to develop a joint healthcare program demonstration for military retirees and their family members over the age of 65. The passage of this legislation ended a several year effort by DOD and military retiree groups to begin such a program. Commonly referred to as "Medicare Subvention," this demonstration program would allow six sites around the United States to provide priority healthcare services to a limited group of eligible retirees and spouses with the potential of receiving reimbursement from Medicare and the HCFA. The demonstration is authorized to operate for the 3 years beginning 1 Jan 97 and will be evaluated by the Office of Management and Budget and the General Accounting Office during the length of the demonstration. The goal is to determine whether the DOD can perform sufficiently as a Medicare+Choice program and continue to provide care to older military retirees without incurring additional costs to the federal government in the aggregate.

The TRICARE Senior Program

The DOD has named the Medicare Subvention demonstration the "TRICARE Senior Program." As directed by the BBA, this program is comprised of

two components. The first component is the development of a Medicare Health Maintenance Organization (HMO) called TRICARE Senior Prime. The second component is called "Medicare+Partners." Under Medicare+Partners, selected DOD sites will serve as preferred providers for commercial Medicare HMOs, performing healthcare services for eligible retired members of the approved commercial HMOs and receiving reimbursement from the HMO for those services. The Medicare+Partners program will begin no earlier than 90 days after TRICARE Senior Prime begins and is still in the planning stages at DOD. The focus of this article will be the implementation of TRICARE Senior Prime.

TRICARE Senior Prime

TRICARE Senior Prime is the DOD HMO option for Medicare-eligible military retirees and their spouses over the age of 65 who reside in the immediate catchment areas of selected military treatment facilities (MTF). Under current law, this category of retiree is not eligible to enroll in the commonly known TRICARE Prime program for eligible beneficiaries under the age of 65. While these older retirees have always been eligible for "space-available" care in the MTFs, they were not eligible for DOD funding under CHAMPUS (now TRICARE) for services received outside the MTF. The Medicare Subvention demonstration will suspend this law in selected demonstration sites by allowing MTFs to enroll limited numbers of eligible beneficiaries into a program much like TRICARE Prime in addition to paying for services obtained outside of the MTF. Those eligible retirees who enroll in TRICARE Senior Prime will receive services with the same level of priority as retirees under the age of 65 who are enrolled in the traditional

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TRICARE Prime program. In addition, to meet federal requirements of approved Medicare+Choice plans (Medicare HMOs), services that are not covered under TRICARE Prime are also provided, such as home healthcare, skilled nursing facility care, and hospice care services. Where the Medicare benefit and the traditional TRICARE Prime benefit differ, the TRICARE Senior Prime member will typically receive the better benefit in order to receive at least the minimum required benefit from each program.

TRICARE Senior Prime Sites

Selection of the TRICARE Senior Prime sites was made jointly by the DOD and the DHHS. Limited to six sites by the BBA, site selection was not a simple task. Several factors were considered and weighed to determine appropriate locations for the demonstration. Among the considerations were MTF capabilities and the desire to evaluate the program across a variety of MTF sizes and types. Some of the other considerations were local retiree population, availability of local civilian services which could support the MTFs, and maturity of existing TRICARE Prime programs. Seeking a wide variety across all of these and other considerations, the final sites were selected by DHHS and DOD. These sites are:

- San Antonio, Texas – comprised of Brooke Army Medical Center, Wilford Hall Medical Center, and site expansion into Fort Sill, Oklahoma, and Sheppard Air Force Base, Texas
- Madigan Army Medical Center, Fort Lewis, Washington
- San Diego Naval Medical Center, San Diego, California
- Keesler Air Force Base, Biloxi, Mississippi
- Colorado Springs, Colorado – comprised of Fort Carson and the Air Force Academy
- Dover Air Force Base, Delaware

It was understood that other sites were also good candidates for the demonstration. However, due to the limited number of sites authorized and the desire to get a broad spectrum of size, population, program maturity, and other considerations, these sites were finally selected as those that would meet the needs of the two Departments.

Program Development – The Approval Process

It should be understood that the TRICARE Senior Program and its two components are not solely DOD programs. The DOD sites must meet all of the regulatory requirements of becoming a Medicare+Choice program, as does a commercial program. Each of the six sites will be considered under separate application. The requirements they must meet include successfully completing the extensive HCFA application process and a thorough on-site review of each location by teams of HCFA program reviewers inspecting program preparedness. These qualifications are not waived on behalf of this demonstration. This review and approval process can take up to 18 months for commercial plans but, due to the time constraints of this demonstration, HCFA is working to accelerate the process so that there will be sufficient time to evaluate the actual operation of the program itself before the 3-year term ends. Still, the review process is on a very aggressive schedule and DOD's compilation of the applications, notwithstanding, is reliant on HCFA's thorough review process. As this article is being written, the applications for San Antonio and Madigan have been completed and forwarded to HCFA for review of completeness. The remaining applications are being compiled for submission to HCFA for the review.

Following HCFA's acceptance of the completed applications, a site-visit is scheduled. On a scale similar to that of a survey of an MTF by the Joint Commission for Accreditation of Healthcare Organizations, the sites will undergo evaluation of the health plan. The focus of this survey is the health plan in particular, not specifically the operations of the MTF alone. Reviews of plan management, grievance procedures, appeals processes, network adequacy, and a myriad of other aspects of the health plan will be evaluated in detail. It is anticipated that HCFA could begin site visits sometime beyond 5 weeks after acceptance of completed applications.

Contract Support

The DOD TRICARE program enlists the assistance of managed care support contractors to augment DOD assets in the operation and administration of the TRICARE program. As part of this support, DOD has modified these contracts to further support the TRICARE Senior Prime program in the six demonstration sites. Among several tasks amended to the original contracts are requirements for the contractors to provide substantial numbers of hours to consult with the sites in preparation for the

HCFA site visits. The intent is to capitalize on the corporate experience of these contractors in Medicare risk contracting while preparing the sites in meeting HCFA requirements which have been foreign to DOD in the past. Additionally, the contractors will perform virtually the same functions to support the Medicare program as it does under the traditional TRICARE Prime program. These functions include establishing a network of external providers, performing enrollment functions, assistance with marketing, payment of claims, and a myriad of other tasks. While contract requirements are specified in the official contract modifications, each site and their supporting contractor establishes a memorandum of understanding that addresses local implementation coordination and plans.

Funding and Medicare Reimbursement

The term "subvention" indicates a grant of financial support from one institution to another. In the context of Medicare Subvention and the TRICARE Senior Prime program, it is taken to mean that HCFA will support DOD in funding the care of enrollees in the Senior Prime program. The DOD, however, has used appropriated funds to care for Medicare-eligible military retirees in the past, which is deemed the historical level-of-effort (LOE). The financial support that may be forthcoming from HCFA will be paid for the dollar value of care provided beyond the LOE as established by the Office of Management and Budget. The LOE calculated for this demonstration is expected to be the LOE for the six sites, taken together. For care provided beyond the historical LOE (in FY 96 dollars) HCFA will reimburse DOD based on a capitated amount per Senior Prime enrollee.

Reaching the LOE at each site can be accomplished by a combination of two factors. One factor is the dollar value of care provided to enrollees. Under the rules of the demonstration, the sites must provide at least 30% of all care to the 65+ age group who are enrolled at each site. The remaining dollar value of care may be credited to the second factor, the space-available care provided to nonenrollees over the age of 65. In the second and third years of the demonstration, the percentage of care provided to enrollees must be at least 40% and 50%, respectively. Again, the balance may be comprised of space-available care (adjusted to dollars). When the sites exceed the historical LOE, satisfying the appropriate ratios of enrolled versus nonenrolled care, HCFA will begin paying a per-capita amount of money to DOD. This reimbursement rate is set at 95% of the amount of per-capita payments traditionally paid to

commercial Medicare+Choice plans in the site's local area. This amount is then reduced by considerations for capital improvements, graduate medical education, and other factors that are partially included in normal DOD appropriations for the MHS.

When TRICARE Senior Prime members are referred into the network for services not available in the MTF, the contractor will function as the fiscal intermediary for payment of claims to the private providers. The sites will then reimburse the contractor for those costs out of allocated budgets traditionally referred to as "supplemental care." All of the funds paid for authorized Medicare services for Senior Prime enrollees are included in attaining the LOE for the enrolled group.

In essence, there is an incentive for the sites to deliver care beyond the historical LOE, thus reducing the demand for traditional Medicare services in the commercial market and thus, working to result in a break-even expenditure or less for the federal government in total. The subvention reimbursement would be expected to cause a shifting of funds from DHHS to DOD at favorable rates instead of requiring older retirees to use more expensive fee-for-service Medicare benefits on the commercial market. The DOD would expect to use potential DHHS reimbursement funds to cover its costs of providing care to this population of beneficiaries and maintaining its historical desire to continue providing care to military retirees.

The Benefit for the TRICARE Senior Prime Member

What does an over-65, military healthcare-eligible retiree receive as a member of TRICARE Senior Prime? As with the traditional TRICARE Prime program, members of Senior Prime will have their own primary care manager or clinic who will manage all of their healthcare needs. They will have the same guaranteed access for urgent care, routine appointments, and wellness and specialty visits. Their level of priority for these services will be the same as for retirees enrolled in TRICARE Prime – preceded by Active Duty and Active Duty family members enrolled in TRICARE Prime. They will also receive pharmacy benefits under Senior Prime that they would not have under the traditional Medicare program. Additionally, they will receive assistance in obtaining care, when authorized, either from the MTF or from the civilian network if necessary. The complete listing of benefits will be provided to potential enrollees as marketing begins in each site.

Limitations within the TRICARE Senior Prime Program

As mentioned earlier, the TRICARE Senior Program is limited to six sites. Even beyond this limitation, the number of military retirees and spouses potentially eligible for TRICARE Senior Prime is problematic. The sheer numbers of potential members far exceed the capacity of the MTFs in terms of the number of primary care managers available and their capacity to enroll a panel of members and effectively manage their care. Since Senior Prime is following on the heels of the traditional TRICARE Prime program for other beneficiaries, the capacity of these primary care managers and their MTFs is further limited. Unlike the traditional TRICARE Prime program, this demonstration does not allow for enrollment to civilian primary care managers. Therefore, sites must limit the number of members they can enroll in order to provide guaranteed access and the best quality of care for those who do enroll. This issue is perhaps the greatest challenge for the MTFs as they strive to reach and exceed the historical LOE with the proper ratio of enrolled and space-available care. All of the MTFs are making great efforts to optimize their enrollment capacity through innovative methods in the attempt to enroll as many retirees as possible and reduce the number of those who desire to enroll but cannot be accommodated.

The eligibility requirements that must be met to apply for enrollment also constitute a limitation. To be eligible for enrollment consideration, an applicant must be eligible for military healthcare (though not a dependent parent of a sponsor) and be over the age of 65. They must also have used a MTF prior to 1 Jan 98 or became dual-eligible after 31 Dec 97, and they must be covered under Medicare Parts A and B (to include paying the monthly Part B premium charged by HCFA). If a potential enrollee has passed their 65th birthday and did not begin paying the Part B premium, they will find it necessary to rectify this situation with their local Social Security office. There may be some cases where

equitable relief may be granted by the Social Security Administration, alleviating the requirement to pay a 10% penalty for each year past the 65th birthday that the retiree did not maintain the premium.

There is also a potential limitation within the program's MTFs in maintaining and surpassing the historical LOE. Due to tightening federal budgets and reductions in military strength in recent years, MTFs may find it increasingly difficult to maintain the volume of services provided to beneficiaries, in general. While care for enrolled beneficiaries will remain guaranteed, whether provided within the MTF or referred out to the civilian network, the ability of the MTF to maintain space-available care could be constrained, and potentially hamper the sites from meeting the historical LOE. This issue will continue to challenge the leadership of the MHS.

The Outlook

The many challenges posed by the Medicare Subvention demonstration offer many opportunities for the MHS to develop new ways of enhancing its performance in a rapidly changing healthcare environment. It is difficult to determine at the beginning of this demonstration if the MHS will validate its ability to perform as a Medicare+Choice plan in addition to its other missions. This demonstration is fortunate that there are thousands of dedicated military, civilian, and contract staff striving to give it their best effort. Most importantly, the DOD continues to develop innovative ways such as the TRICARE Senior Program to continue caring for older retirees and their families.

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Beyond MPT: Medical Training for High Profile Units

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Medical proficiency training (MPT) is the standard method by which field units get hands-on experience with real patients in medical treatment facilities (MTF); however, high profile field units with critical medical missions may require levels of medical proficiency exceeding available MPT. This article describes an innovative program to provide field units with a high degree of medical experience and training in emergency and trauma care. The potential value of this training for other units is discussed, and implications for the MTF are described.

Introduction

The MPT is the standard method of providing regular clinical experience for enlisted medics (MOS 91B) assigned to field and maneuver units in the U.S. Army. Regulations specify 60 to 90 days of training every year.¹ Training is generally conducted at the MTF at the installation where the field unit is located.

The MPT was implemented to compensate for the lack of clinical exposure (live patient contact) found in the routine operations of a peacetime field unit. However, certain high profile units may have requirements exceeding the ability of a standard MPT program. This article describes an innovative medical training program designed to supplement MPT. The potential value of this training for other units is described, and the potential benefit and impact on the MTF are discussed.

Need for Additional Training

The 507th Medical Company (Air Ambulance) is a UH-1-equipped helicopter ambulance unit. In addition to the wartime and mobilization mission common to all field units, the 507th is also tasked with two other high profile missions: (1) full-time pre-hospital and evacuation services for all field training areas on Fort Hood; and (2) when available, civilian Military Assistance to Safety and Traffic (MAST) missions to the surrounding community. Since Fort Hood is the military's largest installation and the

population of the surrounding community exceeds 250,000, the demand and visibility of these services is high.

The MPT at Fort Hood takes medics from field units and rotates them through many MTF departments including wards, intensive care, physical examinations, emergency department (ED) and family care, and other outpatient clinics. The relatively small size of the MTF, Darnall Army Community Hospital (116 average daily inpatient census, 980,000 outpatient visits per year) limits the maximum number of MPT slots to 60 at any one time. Additionally, acutely ill or injured patients (the patients most likely to simulate the type of casualties expected in war) are generally limited to the ED, which has only 16 beds and can handle only two to three MPT students at a time. Thus, most MPT students will get little exposure to critically ill and injured patients.

The high profile of the 507th Medical Company and the ongoing need for proficiency in the management of acutely ill or injured patients drove the leadership of the unit to seek additional training beyond MPT. The physician in the MTF charged with monitoring the quality of care for the 507th concurred in this regard.^{2,3}

Program Design

To compensate for the lack of acute care exposure in MPT, a program was designed to maximize the flight medic's ED experience. Goals of the program were threefold: (1) to increase the experience of the medic to the evaluation and management of acutely ill and injured patients; (2) to provide an opportunity to perform emergency medical procedures appropriate for a flight medic; and (3) to increase the interaction of the flight medic (pre-hospital personnel) with the ED staff (hospital personnel).

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To meet these goals, flight medics were placed (after appropriate orientation) alongside medics regularly assigned to the ED and were expected to perform similar functions. Supervision and reporting responsibilities were similarly aligned with the ED staff, with all medics reporting to the shift leader on duty (an experienced medical noncommissioned officer [NCO]).

Because of the intensive and dynamic nature of routine ED operations, the hospital had certain expectations of the flight medics on an ED rotation: (1) an appropriate orientation would be accomplished by all participants prior to starting; (2) the rotating medics would establish a regular presence in terms of length of duty; and (3) the 507th leadership would participate in supervision and oversight of the program in cooperation with the ED leadership.

Hospital expectations were met by establishing a 2-week orientation conducted jointly by the hospital and the 507th. Also, flight medics would be assigned to the ED on evening shifts for a period of at least 12 weeks (as special duty).

Lastly, the flight platoon sergeant and medical standards NCO (a senior flight platoon medic) made regular inspections of his soldiers and participated in hospital education and quality assurance programs.

Flight medics work an average of 40 hours/week on evening (1,500 to 2,300) shifts, weekends included. Evening shift is the busiest at Darnall, with 75 to 100 patients seen on the average, and the flight medics participate in the direct care of many of these patients.

Procedures performed are listed in the table. As part of routine ED in-service continuing education, flight medics are able to participate in cardiopulmonary resuscitation recer-

tification, advanced cardiac life support classes, and similar programs.

Feedback from leadership and participants indicates a high degree of satisfaction with the program. Flight medics appreciate the opportunity to treat real emergency patients and work alongside highly trained physicians, nurses, and fellow medics. The ED personnel appreciate the extra set of helping hands and are satisfied with the commitment of the participants to providing good-quality care. One indicator of success is the increasing number of inquiries the hospital receives from other field units requesting participation in this program.

Discussion

The MPT was designed to provide all field medics with the opportunity to provide real patient care in the MTF. In this controlled, supervised setting, field medics would receive one-on-one instruction and feedback on proper patient care. However, MPT may not achieve its promise in many cases.⁴ Insufficient or

Selected Procedures Performed and Trained on by Flight Medics in the ED:

- vital signs measurement
- oxygen therapy
- oral/nasopharyngeal airway
- bag-valve-mask ventilation
- suction (oropharyngela)
- cervical immobilization
- chest compressions (basic life support) — (cardiopulmonary resuscitation)
- intravenous access
- fluid administration
- nasogastric intubation
- bladder catheterization
- bandaging, splinting, crutch fitting
- wound irrigation and preparation
- tetanus immunization
- sterile field preparation

Table.

inadequate patient care opportunities, competing training and operational demands, and variable installation commitment are some of the hurdles facing an MPT program. The challenge is particularly acute for high profile units with specific training needs. Our program overcomes these hurdles by directly matching a high profile unit with a high-volume, high activity ED in an MTF. Furthermore, the long-term relationship ensures regular exposure to emergency patient care, as opposed to the intermittent and variable exposure characteristic of MPT.

This program represents a classic "win-win" situation for both the 507th Medical Company and the Darnall Army Community Hospital. The medical company benefits by obtaining high-intensity, emergency patient care training. Low-yield training (rotations in physical examinations section or routine hospital ward) with little direct application to emergency pre-hospital care is bypassed in favor of the high yield ED. The hospital, in turn, gains the commitment of a field unit to send a highly motivated individual to provide patient care in a special duty status. In an environment of dwindling resources, hospital commanders are eager to accept competent help. Both parties gain by the increased interaction of their staff. Since both the 507th Medical Company and the hospital ED share responsibility of the emergency care of patients on Fort Hood, improved working relationships can lead to improved patient care.

Our experience with this program has implications for other units wishing to explore improved medical training. While local conditions and resources will

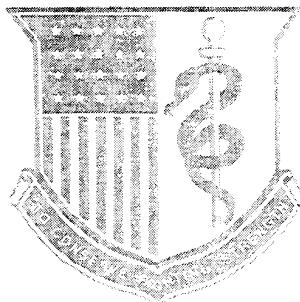
dictate many of the options available, our model may prove useful as a starting point. Several features of our program may be unique, including the high profile and utilization of the air ambulance company, the relative mismatch between the large number of field units in need of training, and the small size of the hospital. Furthermore, by choosing a medical company with a MAST mission, the need for medics to have prior emergency medical technician (EMT) certification was obviated because certification is required of all MAST flight medics.² (EMT certification is a requirement for medics in the ED.)³ Choosing a different unit with few EMT-certified medics may impose restrictions on their employment in the ED.

Conclusion

A customized emergency patient care training program can be implemented for high profile field medical units by establishing direct participation with an MTF ED.

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Inpatient Burn Unit LOS and Analysis of Treatment Supply Costs

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This retrospective study investigated the effects of percent of body surface area (BSA) burned, sources of admission, patient gender, age, beneficiary status, final disposition on inpatient length of stay (LOS), and treatment supply costs for 488 burn unit victims over a 2-year period (1994 to 1995). Trends for LOS associated with burns revealed a highly and statistically significant curvilinear pattern across percent burn categories with multiple $r = .56$. A linear trend emerged for over \$12 million in supply costs related to percent burn categories with simple $r = .68$. Hierarchical regression analyses further confirmed the curvilinear LOS hypothesis, with $F(2,475) = 135.38$, $P < .001$. Burn percent also emerged significant with $F(1,475) = 134.67$ for treatment costs, while holding constant the effects due to all other patient variables. Additional analyses revealed significant differences among inpatient characteristics for disposition of both LOS/costs and differences for LOS due to age, but no apparent effects were revealed due to differences in patients' gender, source of admission, beneficiary category, or study year while holding constant the effects due to other patient predictor variables.

Introduction

The scope and intensity of resources required to deliver inpatient burn care make it among the most expensive treatments of all healthcare services.^{1,2} Annually, approximately 300 individuals per million of the population are hospitalized due to severe burns. Approximately 42 of those 300 individuals per million require care in a specialty burn care center.¹ In the U.S., burn care received at hospitals and specialty burn care centers is estimated to cost 1.12 billion annually.³

Typically, burn centers range from 4-to 40-bed units and provide specialized personnel, equipment, and facilities necessary to treat individuals who sustain severe burns.^{1,4} In 1950, the Department of Defense

(DOD) established the first burn center at the U.S. Army Surgical Research Unit.¹ Currently, the U.S. Army Institute of Surgical Research (ISR) Burn Center collocated in South Texas with Brooke Army Medical Center (BAMC), a Level III DOD trauma center is responsible for treating DOD active duty personnel, dependents, retirees and their dependents, designees, and other citizens from the local community.

Minimal research has been conducted for analyzing inpatient LOS and the costs associated with treating burn patients in DOD facilities. A major study conducted in the civilian sector by Pruitt, Mason, and Goodwin at the Department of Surgery/Burn Center, New York Hospital-Cornell Medical Center in New York City, revealed that burn injuries and burn deaths are associated with the age, occupation, and economic circumstances of an individual. Approximately 2 million people in the U.S. suffer burn injuries each year, however, the exact occurrence rate of burn incidents is unknown.¹ Annually, about 90,000 individuals out of the estimated 2 million which sustain burn injuries require care in a hospital. Of the 90,000 individuals which require care, 20,000 are transferred or admitted directly to specialty burn care centers.¹ Eldad and Israeli found that individuals treated at specialty burn care centers require an average of about 15.8 days of hospitalization.³ The length of hospitalization is based on the percentage of BSA burned and the degree of burn sustained. The best estimate for LOS is that for every percentage of BSA burned, a patient will require 1 day of hospitalization.³

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For example, a patient sustaining 10% BSA burned would require approximately 10 days of hospitalization.

Typically, the percent of BSA burned is calculated by one of three methods: the palmar method, rule of nines, and the Lund and Browder chart. The palmar method is used for individuals sustaining minor burns, and is also the quickest to execute.⁵ The method uses the patient's palm to measure the area of BSA burned; every palm equals 1% of the BSA. In emergency situations, the quicker but less accurate rule of nines is the primary method used. This method, which tends to overestimate the percent of BSA burned, separates and measures the body by five distinct sections. For adult body measurements, the head accounts for 9%, the trunk-36% (18%-front and 18%-back), each arm is 9%, each leg is 18%, and the genital area is 1%. For children, the head comprises 18% of the body, the trunk is 36% (18%-front and 18%-back), each arm is 9%, and each leg is 14%.⁶ The preferred method for calculating the percent of BSA is the Lund and Browder chart. The chart includes the area of the body, adjusting for age of the patient, and the percentage and degree of burn.^{5,7}

Burn injuries do not discriminate between the parts of the human body that are susceptible to injury. Every part of the human body, both internal and external, is vulnerable to burn injuries. The size and extent of the burn dictates the effects on the different systems in the human body.⁸ Consequently, severe burns can lead to organ dysfunction and even death. Mortality rates are highest during the first 10 days after a burn injury and are considerably lower after this initial period.¹ Death is strongly associated with the age and the extent of injuries sustained by a burn victim.¹ Consequently, death rates are higher among young children and the elderly.^{1,7}

Two additional factors associated with the burn victims' outcomes are the needs and costs associated with treating burn patients. Burn care needs increase as the percentage of BSA increases. For example, as the percentage of BSA rises above 50%, the needs for specialized care treatment and resources increases. The resources are particularly intensive for severely burned patients because of the care received in a burn unit's intensive care unit (ICU). A nurse workload study conducted at the U.S. Army's ISR burn unit found that patients receiving care in the burn unit's ICU required an average of 28.3 hours of nursing care per day. Furthermore, patients needing ICU care require a vast amount of specialty care, ancillary care, and resources. Some of the medical specialists required

for treating severely burned patients include plastic surgeons, orthopedic surgeons, cardiologists, and psychiatrists.¹

The burn care needs of a patient are based on the costs associated with survival, functional recovery, and cosmetic result. The costs associated in obtaining these outcomes are relatively difficult to determine. This is attributable to the differences in the number of beds within burn care units. Moreover, burn care units are very resource intensive due to the requirements of specialized personnel, equipment, and facilities to treat patients. Units may find that they are not operating efficiently because their staff and resources outweigh the number of patients that are being treated.¹

The costs of personnel, support services, and ancillary services associated with treating burn patients are tremendously high. New York State Hospital found that 43% of the costs associated with treating burn patients are attributable to personnel, while logistics (supplies, administrative, and all other services) accounted for the remaining 57%.¹

Burn centers across the country face several economic challenges which threaten their future. Burn centers require extensive resources to maintain a burn unit. The reimbursement deficits caused by current prospective payment systems result in losses by hospitals that support them.^{1,2,9-13} The complexity and variety of services involved in treating burn patients make costs difficult to define. At the ISR burn unit, costs are particularly elusive due to the system of shared research between ISR, which provides personnel resources, and BAMC, its supporting Level III trauma center, which provides the remainder of the support. Identification of the types of costs associated with treating a wide array of inpatients with various periods of hospitalization at the burn care unit is an ongoing problem. The purpose of this study was to examine possible predictive factors affecting both inpatient's LOS at the burn unit and subsequent costs for treatment supplies.

Method

Sample and Data. In order to conduct this study on the costs and LOS associated with treating patients at the burn unit, data was obtained from the DOD Patient Administration Systems and Biostatistics Activities (PASBA) and the Medical Expense and Performance Reporting System (MEPRS). The data included the 8% of BSA burned, age, gender, source of admission, beneficiary category, discharge disposition, and year treated at the ISR burn care unit.

The sample for the study consisted of 488 medical records of inpatients at the burn unit over a 2-year period (1994 to 1995). Data was collected from PASBAs Standard Inpatient Data Record system, a database which serves as a central record repository for all DOD medical treatment facilities (MTF). All records for the period reported to PASBA as of Oct 96 were included in the sample (N = 488), excluding 16 incomplete records.

Operationalization of Variables. The two dependent variables of this research study were inpatient LOS and treatment supply costs. Supply costs obtained were based on an algorithm calculated by PASBA personnel utilizing the data from MEPRS. The supply costs include medical materiel and all other support costs utilized by the burn unit calculated by using a step-down method, which assigns overhead operating costs (not directly attributable to a particular ward or unit) proportionally among hospital sections. These costs include base operations charges, such as administration, education and training, housekeeping, laundry and plant and ancillary support services such as the pharmacy, pathology, nuclear medicine, and central materiel services.¹⁴

The independent variables included source of admission, patient gender, beneficiary category, percent burn categories, disposition, and year of admission. Year was coded as a binary variable, with 1994 = 0 and 1995 = 1. The percent burn variable coded by PASBA provided the data as a scaled (0-9) variable, with 0 = 1-10%; 1 = 11-20%, and so on

through 9 = over 90% of BSA burned. These percent reflected the four-digit diagnosis-related group codes, 9,480 through 9,489, indicating the corresponding percent burn.¹⁵ Beneficiary category was defined as five mutually exclusive binary variables indicating the patient's status as military, dependent of military, retiree or dependent of retiree, designee, or other. While the first three categories are self-explanatory, the last two require definition. Designees are those individuals who would not normally be beneficiaries of the military health services system, but who are authorized to receive care in a military MTF by one of the service secretaries. Other beneficiaries include emergency treatment provided as assistance to the local civilian community. Source of admission was coded as binary to represent whether a patient was directly admitted (1) to the burn unit or transferred (0) from another MTF. Gender was coded as binary (male (1) or female (0)). Age was a continuous variable, measured in years (15 cases [range 4 to 11 months] were recorded as 1 year old.) Patient disposition showed the discharge status as a set of three binary variables (the patient went home, was sent to another MTF for more inpatient care, or died while admitted to the burn unit.)

Results

Tables 1 and 2 present descriptive statistics for the outcome variables. Correlations for continuous predictor variables are shown in Table 1, with categorical data means and standard deviations depicted in Table 2. The average LOS of nearly 25

Variable	Mean	SD	Correlations (r)*	
			LOS	Supply Costs
Length of Stay (days)	24.90	25.21	—	.774
Supply Costs (\$)	25,014.00	33,946.00	.774	—
Percent Burn (1-10 scale)	1.27	1.83	.506	.682
Patient's Age (Years)	29.48	20.77	.104*	.119

*All correlations statistically significant, P<.01; except Age-LOS, P<.05.

Note: N=488 burn unit patients. All treatment supply costs are rounded to the nearest whole dollar.

Table 1. Descriptive Statistics for LOS, Treatment Supply Costs, Percent of Burn, and Patient's Age

Patient Category	Sample size		Length of Stay		Treatment Costs	
	n	percent	Mean	SD	Mean	SD
Source of Admission						
Direct	320	65.57	29.94	27.18	\$22,956	31,114
Transfer	168	34.43	22.26	23.73	\$28.934	38,570
Gender						
Male	411	84.22	25.07	26.10	\$25,038	34,951
Female	77	15.78	24.01	19.91	\$24,887	28,178
Beneficiary Category						
Designee	274	56.15	33.07	23.60	\$24,944	34,159
Military	104	23.31	26.60	24.40	\$22,921	27,912
Dependent	45	9.22	14.33	10.80	\$12,845	8,859
Retiree	20	4.10	29.65	40.90	\$39,625	58,955
Other	45	9.22	34.56	34.00	\$35,952	41,598
Percent Burn Categories						
1 – 10	229	46.93	13.24	10.22	\$11,718	8,110
11 – 20	119	24.39	24.16	18.06	\$16,575	11,793
21 – 30	55	11.27	37.36	27.68	\$25,059	23,745
31 – 40	32	6.56	39.50	20.24	\$44,240	30,670
41 – 50	21	4.30	52.86	20.48	\$77,005	50,122
51 – 60	10	2.05	58.90	31.08	\$83,506	44,064
61 – 70	5	1.02	72.60	50.86	\$119,791	54,998
71 – 80	7	1.43	68.71	73.69	\$119,798	86,519
81 – 90	8	1.64	47.88	63.77	\$101,815	73,596
91 – 100	2	.41	1.00	.00	\$26,458	27,762
Disposition						
Home	387	78.69	20.70	18.83	\$15,932	16,733
MTF	73	15.57	51.07	38.55	\$60,203	60,606
Death	28	5.74	14.75	14.96	\$58,806	37,806
Year of Admission						
1994	249	51.02	27.08	27.68	\$25,439	36,470
1995	239	48.98	22.64	22.18	\$24,572	31,170

Note: All subcategories total to N=488. Treatment supply costs are rounded to the nearest whole dollar amount.

Table 2. Descriptive Statistics for LOS and Treatment Supply Costs by Associated Patient Categories

days and treatment supply costs of over \$25,000 illustrate the resource intensity of burn treatment. Previous research results indicate that supply costs may account for less than 60% of total inpatient treatment costs, with the remaining 40% as personnel costs.¹ This would suggest that the average total costs associated with treating these burn patients could exceed \$40,000.

Table 2 arrays inpatient days and costs for various patient categories. As shown, little differences in LOS and costs appear to emerge for admission source, gender, and year. Percent burn, beneficiary category, and patient disposition all exhibit differences among categories for both supply cost and LOS; sources of admission differed only in LOS. Beneficiaries ranged from an average LOS of 14 days for dependents to 33 to 34 days for retirees and others, with supply costs from under \$13,000 to nearly \$40,000 respectively. Over half of the burn unit's patients were designees, reflecting its status as a regional burn center in South Texas.

Patients who died while in the hospital or were transferred to another MTF cost nearly four times as much to treat as those who were ultimately discharged home. Comparison of lengths of hospital stay further reflects differences in the distribution of resources consumed. The average supply costs to treat those discharged home was approximately \$770 per day in the hospital; for patients transferred to other MTFs, the cost rose to \$1,180 per day. For those who died during treatment, supply costs soared to nearly \$4,000 per day in the hospital. This dramatic increase reflects the tremendous surge of resources consumed early in the hospital stay, and the heroic efforts of the hospital staff, attempting to save these patients. The low LOS of those who died is consistent with previous research documenting the highest mortality rates during the first 10 days after a burn injury.¹

Hypotheses: Curvilinear LOS and Linear Supply Costs. Further inspection of Table 2 indicates that the effects of the percent burn categories (1 to 10 through 91 to 100) is not uniform throughout the range of LOS and treatment supply costs. The trend for LOS shows a rapid acceleration from 13 to 24 to 37 days in the first three categories, peaking at 73 and 69 days for the 7th and 8th categories, and decreasing markedly for the last two categories. A similar trend was observed for the treatment costs (see Table 2). These data suggested a possible curvilinear relationship for both dependent variables. Thus, a new analysis variable was added to include the percent burn squared as an additional predictor. Analysis of multiple correlations substantiated

this hypothesis for the LOS variable: r increased from .5064 to .5578, $F(1,485) = 35.83$, $P < .001$. The correlation r only increased from .6816 to .6817 for supply cost when percent burn squared was added. The quadratic function adds substantially to the equation's predictive efficiency for LOS, but was not significant, $F(1,485) = .14$, for supply costs. This reflects the sharp decline in LOS above 70% burn, but with only minor decreases in supply costs above 70% burn.

Hierarchical Multiple Linear Regression Analyses. Techniques of hierarchical multiple regression were used to test hypotheses that each independent variable or set of variables specified in the model makes a unique contribution to explaining variance in LOS and supply costs, over and above the variance it shares with other independent variables in the model. Including all predictor variables in the regression model to control for confounding effects, each individual predictor effect was removed, in turn, to determine the unique variance in LOS and supply costs (Table 3).

Discussion

This research indicated that predictive factors do exist for estimating the length of inpatient hospital stay and supply costs required to treat burn patients. Specifically, the percent of BSA burned and patient disposition are strong determinants of LOS and supply costs. This finding suggests a large proportion of shared variance between these variables and others in the model. Burn center managers may be able to estimate projected costs, at least in the near-term, and plan for appropriate interventions to optimize resources. Additionally, Rees and Dimick suggest that burn centers must market themselves and their extraordinary accomplishments to justify the high-cost care resulting in patient outcomes previously not possible.¹⁶

Future research may expand on these results by incorporating personnel costs as well as clinical nuances which affect the resource intensity and duration of care required. Such a study would require a prospective analysis of individual patients. This would not only enable consideration of each patient's detailed medical condition and care plan, but also would facilitate identification of the actual supply and personnel costs consumed for each patient.

Conclusion

In summary, this retrospective nonexperimental study revealed that two predictor variables are

Effects Tested	R-sqr _D	R-sqr _D	R-sqr _D	df1	df2	F	prob
	Full Model	Restricted	Difference				
Length of Stay (days)							
Admission source	.500	.500	.000	1	475	.01	.922
Gender	.500	.498	.002	1	475	1.88	.171
Age	.500	.496	.004	1	475	4.11	.043
Beneficiary	.500	.499	.001	4	475	.49	.743
Burn and Burn-sqr _D	.500	.215	.285	2	475	135.38	.000
Disposition	.500	.333	.167	2	475	79.66	.000
Year (1994 vs 1995)	.500	.500	.000	1	475	.72	.396
Treatment Supply Costs (\$)							
Admission source	.544	.544	.000	1	476	.20	.656
Gender	.544	.543	.001	1	476	1.13	.289
Age	.544	.544	.000	1	476	.15	.702
Beneficiary	.544	.540	.004	4	476	1.06	.376
Burn Percent	.544	.287	.257	1	476	268.16	.000
Disposition	.544	.479	.065	2	476	34.03	.000
Year (1994 vs 1995)	.544	.543	.001	1	476	.80	.370

Note: Exact probabilities reported, $P=.000$ reflects $P<.001$. Total treatment supply costs for both years = \$12,206,832.

Table 3. Multiple Linear Regression Analysis of the Effects of Patient Characteristics Upon LOS and Treatment Supply Costs

associated with the LOS and supply costs at the burn unit studied. The study revealed that ISR burn unit patient LOS increased as a function of the percentage of BSA burned then fell sharply above 70% of BSA burned. Supply costs regularly increased as a function of the percentage of BSA burned. The one key finding of this research study is that the burn unit can predict over half of variance in total costs associated with inpatient burn care treatment based on the percentage of BSA burned. Future prospective studies should analyze actual costs per patient, and expand the scope of this research to include clinical factors affecting resources required for inpatient burn care.

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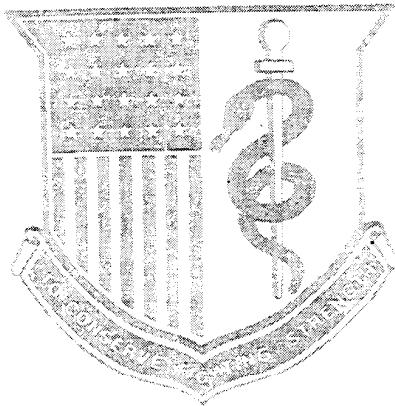
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Case Report: Dental Management of a Patient with Osteogenesis Imperfecta

CPT William H. Logan III[†]
COL James E. Berwick^{††}

The management of the patient with osteogenesis imperfecta (OI) presents challenges to the dental practitioner. This article discusses management considerations for a 36-year-old white female OI patient who presented for extraction of her third molars.

Introduction

The OI is an autosomal dominant heritable disease that primarily affects skeletal, ocular, cutaneous, otic, dental, and vascular tissues.^{1,2} This disease primarily impairs the collagen maturation process. Specifically, mutations have been found to affect the genes that code for the pro-alpha chains of type I collagen.³ Therefore, OI will affect tissues that are rich in type I collagen such as bone. The defective collagen matrix results in bones subject to fracture. Most often, patients present with a history of fractures, blue sclera, dentinogenesis imperfecta (DI), hearing loss, and a strong family history of the disease.^{1,4,5} Sillence suggested a classification of OI into four syndromes, which are presented in the table.¹ Type I is the mildest form of the disease and shows a dominant pattern of inheritance in families. The birth incidence as well as the population frequency of type I is 1:30,000 births.⁶ Blue sclera and hearing loss are commonly found in the type I patient. Type I can be subdivided into types IA and IB depending on the presence of DI.^{4,5,7} Type IB has DI as a presenting feature. In type II the disease is severe and results almost always in prenatal death. The type III patient presents with skeletal deformities as well as DI and blue sclera. These patients tend to become progressively worse with age. Type IV patients can be distinguished from type III patients on the basis of inheritance; type IV is autosomal dominant while type III is autosomal recessive.

Several dental manifestations of OI have been reported. The most common dental involvement is DI. Abnormalities of the teeth in patients with OI include: blue-grey or brown crown shades with an opalescent sheen, and brittle enamel. Radiologic findings are obliterated pulp chambers/canal systems, and a constriction at the junction of the crowns and roots.

Crown morphology can be variable, with bulbous crowns frequently observed.^{8,9} Reports indicate OI patients have an increased incidence of juvenile periodontitis. Scanning electron microscopy has shown dentinal tubular abnormalities consisting of either greatly reduced or totally absent tubules. The tubules are also irregularly distributed throughout the dentin, whereas the enamel remains unaffected.¹⁰

Several authors have described jaw fractures, radiolucent bone lesions, and a case of an odontogenic tumor associated with this disease.¹¹⁻¹⁵ Despite the tendency for fractures to occur in OI patients, the fracture healing process is normal. Fractures are treated as in a patient without the disease. The bone will repair a fracture in 6 to 8 weeks. Some modification in treatment is required in the dental management of OI. A patient with type IB OI will be presented as an example.

Case Report

A 36-year-old white female with diagnosed OI type IB presented to the Oral Surgery clinic for extraction of her carious third molars. Past medical history revealed chronic wrist and hand extensor synovitis. She has had several skeletal surgeries to reduce fractures of the fingers and wrists. There was no history of fractures for 8 years prior to treatment. Family history revealed one daughter also with type IB OI. Both family members are registered with the national data bank of OI located at the Mayo Clinic. Upon clinical exam several findings were noted. The patient's sclera were slightly blue, her teeth were opaque to slightly yellow, and her fingers on both hands were deformed. No gross hearing loss was detected.

Following evaluation and a review of the patient history, the patient was appointed for surgical removal of her third molars. Extraction of the third molars was performed under intravenous sedation. Special care was taken not to put any undue stress on the bony

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Type	Age at presentation	Blue sclera	Inheritance	Abnormal dentition
IA	Newborn to adult	Present	Autosomal dominant	Absent
IB	Newborn to adult	Present	Autosomal dominant	Present
II	Newborn	Present	Autosomal recessive	Present in some
III	Newborn to childhood	Bluish at birth	Autosomal recessive & dominant	Present in some
IV	Newborn to adult	Absent	Autosomal dominant	Present in some

Table. Osteogenesis Imperfecta Syndromes

components of the oral cavity. An atraumatic technique, removal of bone, sectioning of the teeth, and slight apical pressure were all employed. The patient did well during surgery and no complications were noted. The second day postoperatively, the patient returned with pain, a denuded socket, and bad breath. The patient was diagnosed with local alveolar osteitis. She was treated with saline irrigation and a medicated eugenol iodoform dressing. The patient was treated twice for this condition and the patient's condition resolved. No other postoperative interventions were necessary.

Discussion

The incidence of type I OI in the population is 1:30,000.⁷ Awareness of the management of OI is important to the dental practitioner. The diagnosis of OI is usually made on the basis of clinical criteria alone. The presence of fractures together with blue sclera, DI, hearing loss, and a strong family history usually indicates a diagnosis of OI.

Routine dental care should not be avoided in patients with OI. In type IB patients with DI, awareness of the disease process requires some modification of dental treatment. Although enamel thickness is normal in DI patients, it fractures easily resulting in rapid wear. The fracturing of enamel is due to the inadequate support from the underlying abnormal dentin. The treatment of choice is to provide the patient with full crown coverage at an early age. This decreases the amount of wear and allows for acceptable aesthetics. The obliterated pulp chambers and calcified canals make endodontic therapy difficult on the patient with DI. Treatment of an endodontic

lesion often requires extraction and appropriate prosthesis placement.

The OI patient tolerates most dental procedures very well. Simple operative procedures as well as prophylactic cleanings pose no threat to the patient. Prosthodontic considerations must include the amount of force that will be transmitted to the bone with a given appliance. Implants may be contraindicated due to poor integration and possible iatrogenic fracture.

Several treatment modifications were utilized in this patient's care. The use of excessive force was avoided to prevent possible fracture of the maxilla and mandible. Sectioning of the teeth using a surgical handpiece was used as indicated by the tooth morphology and positioning. Delivery of the teeth with only light force on the bone is essential in these patients. Only light pressure, applied to the bone using forceps or elevators should be used for the OI patient. Excessive pressures using forceps or elevators can cause possible fracture. Avoiding fractures is critical for all OI patients. With knowledge of the OI disease process, it is possible for the dentist to provide these patients with quality care without putting them at risk of iatrogenic fracture.

If a fracture should occur in an adult OI patient, the bone will heal in 6 to 8 weeks—similar to the time it takes a non-OI patient to heal. Fractures should be treated in the usual manner with good results expected.

Conclusion

The OI patients have abnormal bone structure, predisposing them to fracture. There are no contraindications to treating the patient with OI.

However, the dental practitioner must be aware of procedures that would cause undue stress on the bone. Developing an understanding of the disease allows these patients access to needed dental care without placing them at increased risk.

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Book Reviews

The Thoracic Spine and Rib Cage: Musculoskeletal Evaluation and Treatment by Flynn TW, ed. Newton, MA 02158, Butterworth-Heinemann, 1996, hardcover, 336 pp, illus, \$65.

Reviewed by Andi Beth Mincer, PT Armstrong Atlantic State University, Savannah, GA.

The purpose of this book, says the editor, is to provide "a reference that the healthcare practitioner can readily use when evaluating (the thoracic spine and rib cage) for injury or dysfunction and screening for organic pathology, in providing appropriate and effective treatment, and in preventing recurrence of problems through patient-directed exercise programs." The 14 contributing authors are a multidisciplinary group; almost all are physicians, osteopaths, or physical therapists.

The book is divided into four sections: essential principles, procedures for examination and differential diagnosis, treatment, and clinical perspectives and concerns. These sections contain chapters covering specific evaluation and treatment techniques for the thoracic spine in addition to topics such as anatomy, neurophysiology, imaging, electrophysiological testing, trauma, myofascial considerations, and injection techniques. The text also includes chapters on the osteopathic perspective and the use and abuse of therapeutic interventions.

The content in this book is covered in tremendous depth, yet the text is readable and organized to facilitate quick reference to specific subtopics. As was mentioned above, this text includes a broad range of topics. Although the text provides information on specific topics related to the thoracic spine and rib cage, part of the value of this work is that a great deal of this information pertains to other areas of the spine and to musculoskeletal topics in general. The large number of illustrations and tables complement the text nicely. The book also contains many photographs,

often supplemented with overlaid arrows or other symbols referring to information in the captions. This feature greatly helps the reader translate static photographs into dynamic techniques.

This text covers examination and treatment techniques ranging from the scan examination to special tests, muscle energy techniques, and exercises/mobilizations (including high velocity thrusts) in detail. It discusses the rationale and intent of each procedure in depth. Patient examples are also included when appropriate.

Because many visceral pathologies also produce symptoms that are felt in the trunk, these possibilities are discussed in detail. This information is helpful both to the practitioner, who might be responsible for treatment of both visceral and musculoskeletal problems, and to those who must distinguish one problem from the other in order to make an appropriate referral.

This book definitely succeeds in fulfilling one of Flynn's primary aims: to fill a void in the literature on the spinal region. Although it is not specifically targeted to physical therapists alone, this book would be a valuable addition to the professional library of any healthcare professional who manages patients with musculoskeletal dysfunction.

Ms Mincer is Assistant Professor and teaches orthopedics and women's health in an entry-level physical therapist program.

Debris of Battle: The Wounded of Gettysburg by Gerald A. Patterson. Mechanicsburg, Pennsylvania: Stackpole Books, 1997 (ISBN 0-8117-0498-X).

Reviewed by Dr Wayne R. Austerman, Historian, U.S. Army Medical Department Center and School, Fort Sam Houston, TX.

On 1 July 1863, the little crossroads town of Gettysburg, in southern Pennsylvania boasted a population of 2,500 people. Within 72 hours its streets and surrounding farm lands hosted an additional 150,000 men as the Union Army of the Potomac and Confederate Army of Northern Virginia descended upon the site to fight a battle which yielded 7,000 dead and over 20,000 wounded by the morning of 4 July. Within another 48 hours, both armies had marched southward as the campaign continued, with the possibility of yet another desperate battle to be fought as the battered Confederate force trekked back to Virginia, leaving 5,400 of its own wounded to the clemency of the enemy. In mounting his pursuit of Lee's Army, Union Commander General George G. Meade referred to his wounded as "the debris of the battlefield," for whom he could not spare his Army's time or resources to assure proper medical care. Retired journalist Gerald Patterson's book deals vividly with the often harrowing treatment provided for the Union and Confederate wounded left in the wake of the war's passage through Gettysburg. His view of the contemporary Army Medical Department (AMEDD) is not always a flattering one as he details its response to what remains one of the largest mass casualty situations in American history.

Patterson acknowledges that Meade and his medical director, Dr Jonathan Letterman, felt compelled to take the bulk of the Army's surgeons and medical supplies with it upon departing the battlefield on 6 July because they fully expected to have to fight Lee again if he turned at bay north of the Potomac. The result of such grim calculation was that only 106 surgeons out of a total of 650 serving with the Army of the Potomac were left behind to care for the wounded. They were provided but thirty of the thousand available ambulances, and the medical supplies remaining with them were to prove wholly inadequate to the task at hand. Located 20 miles from the only available operational railhead in the region, the hospital staffs confronted critical supply shortages even before the battle had ended, for Meade had chosen to keep the roads to his rear clear by holding the Army's medical trains well to the south below the Maryland border.

Letterman and Surgeon General William A. Hammond, normally men of deep insight and

innovative energy, seemed to have misjudged the enormity of the task confronting the AMEDD in dealing with the battle's aftermath at Gettysburg. Claiming that "the greater portion" of the necessary surgical labor had been completed by 6 July, Letterman defended Meade's decision to depart on that date with 87% of the Army's surgeons and rejected any proposal that volunteer civilian surgeons might be needed to help the Gettysburg contingent cope with the situation. This was at a time when literally thousands of casualties still carpeted the fields and orchards surrounding the town as they awaited treatment. When Governor Curtin of Pennsylvania offered to mobilize the state's civilian physicians in service to the Union wounded and provide enough tentage to house them all under canvas, he was rebuffed by Surgeon General Hammond, who assured him that plenty of surgeons were already on hand and that "there is sufficient hospital accommodation and ... tents are not needed."

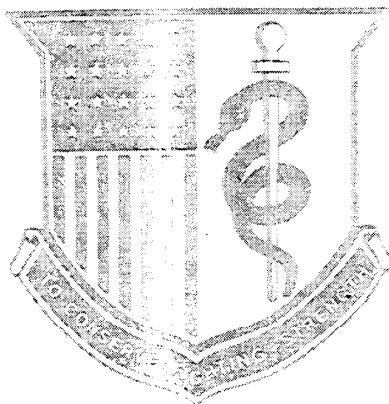
Whether through miscalculation or complacency, the AMEDD was not prepared to cope with the flood of wounded who came under its care after 3 July 1863. Patterson documents the human cost of such official error, citing such examples as one group of 300 Union casualties who were still awaiting treatment as late as 11 July, housed in a barn where "10 or 12 die every day," and the surgeon who, having worked ceaselessly for 3 days and nights to tend incoming casualties, found on 6 July that "I have been left here in charge of 700 wounded with no supplies and have my hands full." Even those wounded who received timely medical care often failed to survive, as in the case of 345 cases of gunshot fractures of the femur. Amputation was performed in 158 of these cases, and 101 of the patients subsequently died of shock, blood loss, or infection.

Surgeon General Hammond was compelled to admit that only the swift intervention of local authorities, the citizenry, and the U.S. Sanitary Commission prevented the situation from sliding into an irremediable disaster. A civilian philanthropic organization, the U.S. Sanitary Commission comprised virtually a "shadow" medical department for the Army, mobilizing its considerable resources to funnel food, medicine, medical supplies, nurses, physicians, and volunteer aides into Gettysburg days before rail service was restored to the town and the first trickle of government aid began to arrive.

If operational necessity, poor communication, and bureaucratic inflexibility had doomed all too many of the wounded to unnecessary death or suffering, their lot was made worse by the hordes of looters, sensation-seekers, and profiteers who descended upon the battle area with a speed which rivaled that of the vultures which soon arrived by the hundreds in the skies over Gettysburg. Dying soldiers had their pockets rifled as they begged for help, fingers were cut from corpses to obtain gold wedding bands, and wounded men were

charged a month's pay for a loaf of bread or a wagon ride to the nearest field hospital.

The Debris of Battle is a horrific story engagingly told and documented with scholarly detail. By turns appalling and inspiring in its accounts of human cruelty and compassion, it drives home the bleak lesson that complacency and bureaucratic myopia proved as lethal as rifle bullets or dysentery for the American soldier in the Civil War.



AMEDD Dateline

Dr Wayne R. Austerman[†]

1 May Walter Reed Army Institute of Nursing, Walter Reed Army Medical Center, was established as a Class II activity under the authority of The Surgeon General in cooperation with the University of Maryland School of Nursing, with the academic aspects of the program under the jurisdiction of the university. (1964)

3 May Army Medical Department surgeons treated the U.S. Army's first land mine casualties when the Confederate defenders of Yorktown, VA, introduced the weapon during the Peninsular Campaign. (1862)

5 May The Union Army of the Potomac suffered the first of an eventual 50,000 casualties incurred during the month-long Battle of the Wilderness in a campaign against Lee's Confederate Army of Northern Virginia. (1864)

8 May General Zachary Taylor engaged enemy forces at Palo Alto, near modern Brownsville, TX, in the first major battle of the Mexican War. By the time the conflict ended on 2 February 1848, a total of 78,718 American combatants had suffered 1,733 deaths from hostile fire, 4,152 wounded and 11,550 deaths from disease, with cholera, dysentery, and yellow fever claiming the most victims. (1846)

VE Day was declared following the surrender of Nazi forces to the Allies on 7 May. At the time, 52,000 Army nurses were on duty in 605 hospitals overseas and 454 hospitals in continental United States. (1945)

10 May Doctor John S. Ford, Lt Col, 2d Texas Mounted Rifles, defeated a larger Union force at Palmito Ranch, east of Brownsville, TX, in the last battle of the Civil War. The action was fought in ignorance of Lee's surrender at Appomattox, over a month previously. (1865)

13 May Hiram Cronk, the last surviving veteran of the war of 1812, died at the age of 105. Cronk, a New Yorker, had enlisted at the age of 15 and served with valor during the defense of Sackett's Harbor, NY, against British attack from Canada. Addicted to chewing tobacco since childhood, Cronk habitually drank at least two gallons of liquor per month until his death. (1905)

15 May Colonel Anna Mae V. Hays, Chief, Army Nurse Corps, was nominated for the grade of brigadier general. She was formally promoted to this grade on 11 Jun, becoming the first woman general officer in the U.S. Army. (1970)

18 May The U.S. War Department established the Sanitary Corps (effective 30 Jun). Commissions were given to officers other than physicians, dental surgeons, and veterinarians who were skilled in sciences related to medicine. This was the forerunner of the Medical Service Corps. (1917)

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18 May	Major General Leonard Wood ended his term as military governor of Cuba as the U.S. ended its occupation of the island in the wake of the Spanish-American War. During his tenure in office, Wood had modernized the Cuban public school system and drafted a new constitution and legal code for the former Spanish colony. Wood had begun his career as an Army surgeon and during the recent conflict had commanded the 1st U.S. Volunteer Cavalry with Theodore Roosevelt as his second-in-command. (1902)
26 May	The U.S. War Department ordered that vaccination, or Jennerian immunization using cowpox, be substituted for inoculation to prevent smallpox in the U.S. Army. A milestone in military preventive medicine, vaccination soon became the generally accepted method for the prevention of smallpox in both the military and civilian communities. (1812)
3 Jun	The Union Army of the Potomac suffered 7,000 casualties in approximately 15 minutes during a futile frontal assault against the Confederate lines at Cold Harbor, VA. (1864)
	President Woodrow Wilson signed a bill providing for a commissioned Veterinary Corps. The law provided for one officer and 16 enlisted men for each 400 animals in the service. (1916)
4 Jun	Congress established the Dental Reserve Officers Training Corps program. (1920)
10 Jun	Secretary of War Simon Cameron appointed Dorothea Dix as superintendent of the nurses serving the Union Army. (1861)
13 Jun	President Lincoln authorized creation of the U.S. Sanitary Commission (USSC). Staffed by civilians, the USSC served as an auxiliary arm of the AMEDD, rendering valuable assistance in terms of providing volunteer medical personnel and supplemental medical supplies throughout the conflict. (1861)
17 Jun	Two thousand five hundred British troops attacked and seized Breed's Hill (aka Bunker Hill) after suffering 226 casualties from a defending force of 1,400 Massachusetts Minutemen. Doctor Joseph Warren, a general in the colonial militia, was killed in action. Doctor Warren thus became the first general officer to die in the defense of the U.S. (1775)
18 Jun	Colonel Florence A. Blanchfield was given Serial No. N-1 as President Eisenhower presented her the first regular Army commission ever given to a woman. In addition to COL Blanchfield, 72 others became regular officers in the Army Nurse Corps. (1947)
21 Jun	Surgeon Albert J. Meyer was appointed first chief of the newly organized U.S. Army Signal Corps. Doctor Meyer's experiments with tactical communications via signaling with guidons or mirrors while posted to Fort Davis, TX, during the 1850s led to him assuming this post during the Civil War. (1862)
25 Jun	Surgeons George E. Lord and James De Wolfe were killed in action along with LTC George A. Custer and 215 other officers and men of Companies C, E, F, I, and L of the 7th U.S. Cavalry in an engagement with Sioux and Cheyenne tribesmen on the Little Bighorn River, Montana Territory. Also slain were enlisted medical orderlies John J. Callahan, Junius Helmer, and Elihu Clear. Doctor William A. Porter and medical orderlies Harry Abbotts and William E. Robinson survived to treat the 60 wounded men of Companies A, B, D, G, and H. The 42 most severe cases required 11 days to reach the nearest post hospital at Fort Abraham Lincoln, Dakota Territory. By that time, three men had died in transit. (1876)

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